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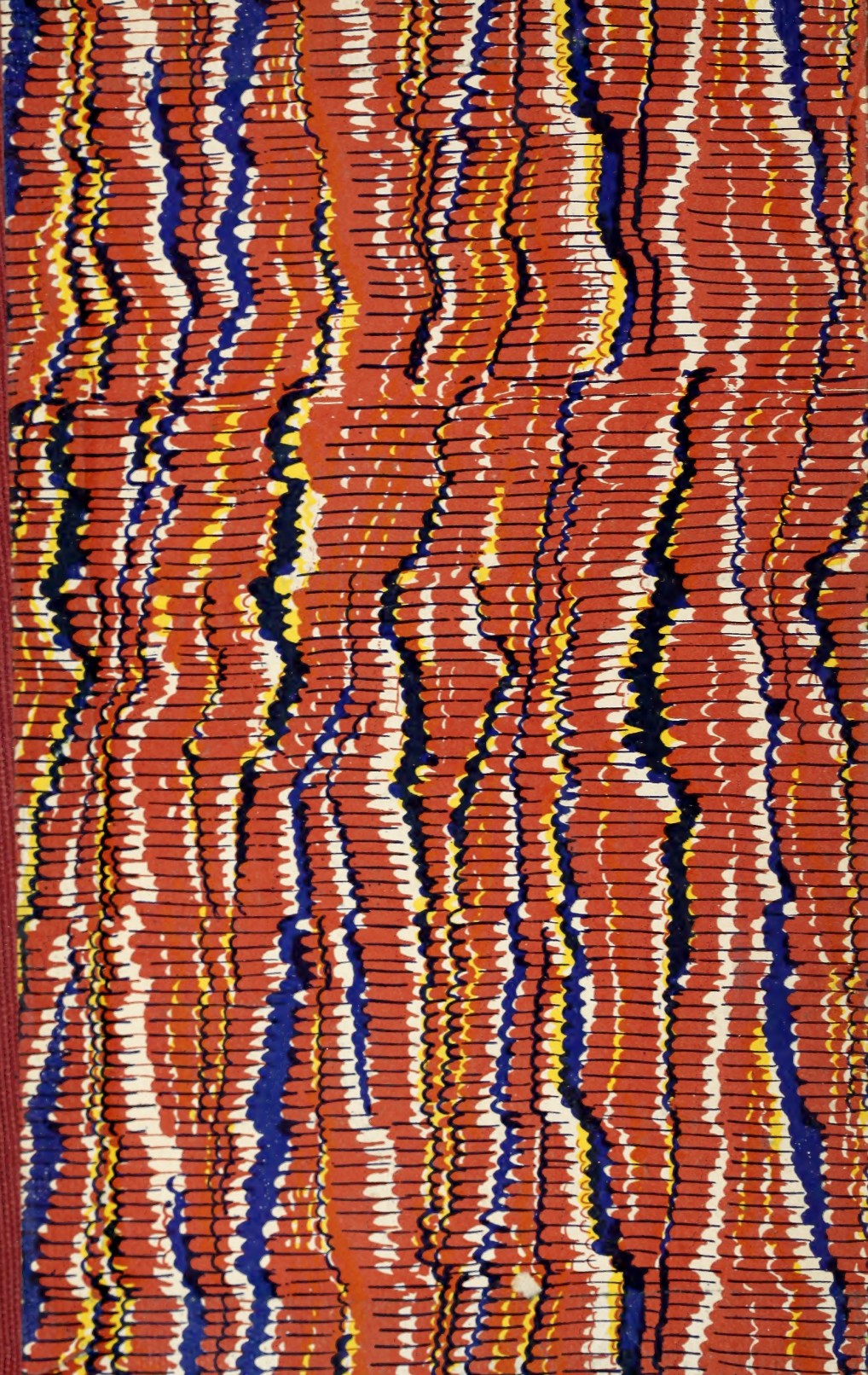

UNITED STATES DEPARTMENT OF AGRICULTURE

BULLETIN No. 826

Contribution from the Bureau of Entomology
L. O. HOWARD, Chief

Washington, D. C. PROFESSIONAL PAPER August 10, 1920

GENERIC CLASSIFICATION OF THE HEMIPTEROUS FAMILY APHIDIDAE

By

A. C. BAKER, Entomologist
Deciduous Fruit Insect Investigations

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Probably no group of insects has received more attention at the hands of economic entomologists than aphids, or plant-lice. Their interesting and often complicated biologies have attracted the attention of investigators, not only among entomologists, but among workers in the larger fields of zoology and general biology. While a large amount of work on the life histories and biologies of aphids has been done, corresponding progress in their classification has not been made. This is probably due to several causes, such as the lack of correlation of biologic and taxonomic facts, and the failure of aphidologists to consider sufficiently the results of the work of others.

On account of the great economic importance of aphids and the necessity of their study in the development of control measures, the lack of knowledge concerning their systematic relationships results in much confusion. Some biologic workers, in fact, do not now attempt to give the name of the species being studied on account of the difficulty experienced in securing correct determinations.

[1] This paper is the first of a series treating the Aphididae. It will be followed by others dealing with the economic importance, biologies, and relationships of species in the different genera.

The present work was undertaken in the hope of remedying such a condition to some extent at least. The genera of the world have been studied. Many workers have lent material and the large collections of the National Museum and Bureau of Entomology have been drawn upon. In the National Museum collection a large percentage of types has been available. To the study of preserved material have been added embryological, anatomical, and biological investigations that a better understanding of the natural relationships might be gained.

Besides many aphidologists in this country and abroad, who have given helpful suggestions and many of whom have read and criticized the manuscript, the writer is indebted to Dr. A. L. Quaintance, of the Bureau of Entomology, for the facilities for conducting many of the biological investigations which to a large extent have laid the foundation for the systematic treatment here given.

Superfamily APHIDOIDEA.

There appear to be two distinct families in the superfamily Aphidoidea. These are the Aphididae and the Phylloxeridae. The present paper deals only with the Aphididae.

Members of the Phylloxeridae differ markedly from forms belonging to the Aphididae. In the first place their biologies are quite different in that parthenogenetic oviparous forms occur during the summer. In the Aphididae only the sexed females which are produced in the fall are normally oviparous.

In structure the two families are separated at once by the formation of the stigma of the forewing. The wing itself seems very little different in an Adelges or Phylloxera from that in some of the specialized genera of the Aphididae. An examination of the freshly emerged wing, however, as has been pointed out by Dr. Patch, shows that the stigma in the Phylloxeridae is formed by the radial sector and the stigmal vein is the media. In the Aphididae, on the other hand, the stigma is formed by radius $_1$ and the stigmal vein is the radial sector. The two families may thus be separated as follows:

KEY TO THE FAMILIES OF THE APHIDOIDEA.

Summer parthenogenetic oviparous forms produced: Stigma formed by the radial sector ..... PHYLLOXERIDAE.
Only sexual oviparous forms produced: Stigma formed by radius$_1$ ..... APHIDIDAE.

A word of explanation in regard to the name Phylloxeridae may be necessary. The genus Chermes was erected by Linnaeus in 1758 and in 1862 was replaced by Psylla Geoffroy. For this genus *Chermes ficus* L. was set as type by Lamarck in 1801. *Ficus*, therefore, becomes *ipso facto* the type of Chermes, and Chermidae the family name of the "jumping plant-lice." The family name for the aphidoidean group, therefore, is derived from the genus Phylloxera Boyer (1834).

PHYLOGENY OF THE APHIDIDAE.

In many published classifications of the Aphididae those groups which according to the writer's conception are the most specialized have been placed as the most primitive. This is the case with those

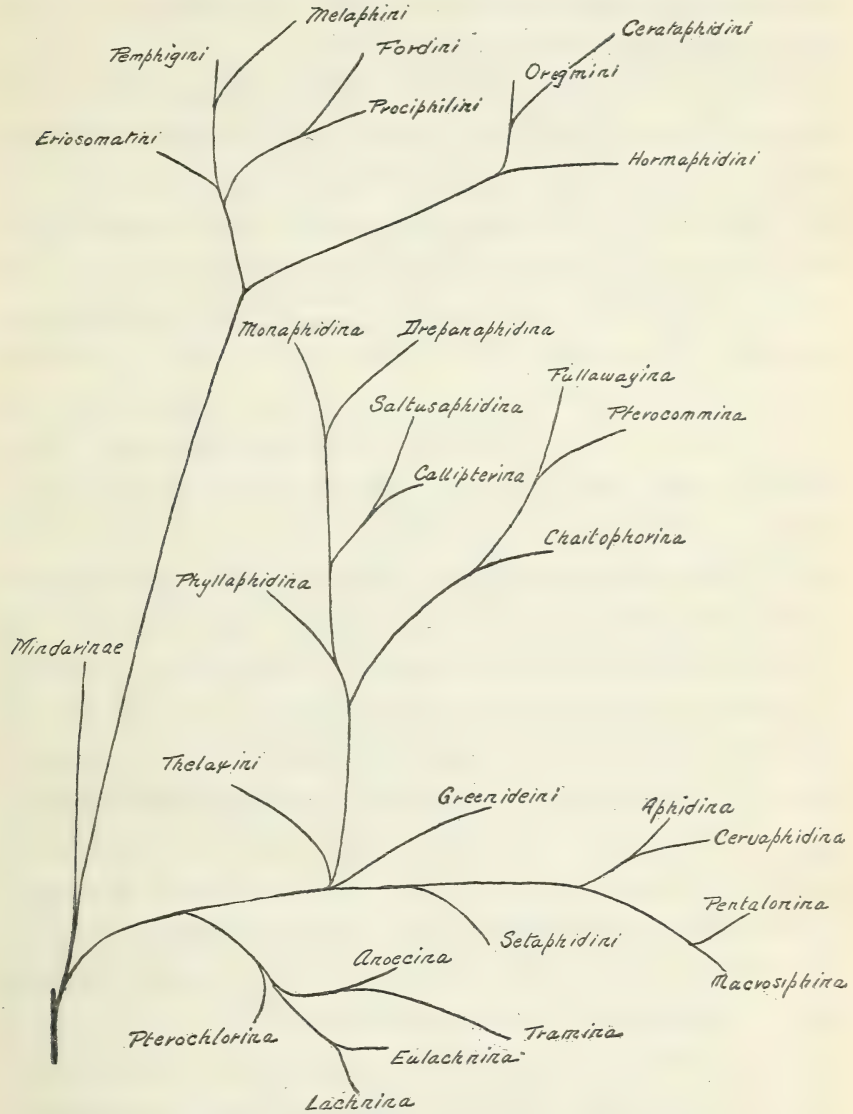

FIG. 1.—Phylogeny of the hemipterous family Aphididae.

insects forming in the present classification the Eriosomatinae and the Hormaphidinae.

A study of the anatomy and the biology of aphids makes it evident that there are three main groups of living forms for which subfamily

names are here used: Aphidinae, Eriosomatinae, and Hormaphidinae. Besides these there is the one species, in some ways a relic of the past, forming the Mindarinae.

As will be seen by the diagram (fig. 1), the Aphidinae is considered the most primitive subfamily of the three main groups. This is substantiated by the habits of the insects, by the structure of the wings, beak, etc., and by the sexual forms.

Practically all of these insects are foliage or twig feeders. They live, as a rule, in colonies and have not developed any very special methods of life, such as highly complex gall formation. With the exception of the Mindarinae the most primitive wing structure occurring in the family is met with here. The media is most commonly twice branched throughout the subfamily and even in the Mindarinae there is more of a reduction than this. The antennæ are of six segments, the largest number found in the family, and the sensoria are simpler in nature than those met with in the other two large subfamilies. The beak in the Lachnini shows also a primitive condition in its segmentation.

The sexual forms are most primitive in the Aphidinae. Winged sexes often occur, at least the males are very commonly winged. Both sexes still retain their beaks and feed on their hosts in the same way as do the other forms, and the ovaries of the female develop normally, and she produces several eggs.

When the phylogeny of this subfamily is studied, there becomes evident the primitive character retained by the Lachnini. In these forms the beak structure and the nature of the antennæ and cornicles point to a primitive condition. The sexes, too, indicate this, though not markedly more than in other tribes. But the fact that these forms are mostly conifer feeders should not be overlooked. It is the opinion of the writer that this is a primitive habit. The Lachnus branch, therefore, may be considered the lowest branch of the Aphidinae. If the wings of fossil aphids be examined it will be seen that by far the greater number of them possess a wing structure quite different from that of our living forms. The radial sector arises back of the stigma, which is usually very long and narrow. This character is retained probably only in the Mindarinae. It is evident, then, that during the development of the present Aphidinae this vein migrated toward the tip of the wing until it came to stand either in the middle of the stigma or near its tip. On one line of this migration is the Lachnina wherein the vein has reached nearly to the tip of the wing and become short and straight. The remaining characters apart from the wings have in these forms remained quite primitive. The subtribe Eulachnina is evidently a more specialized group on this same line of development, for it possesses

the same type of wing. Therefore this subtribe is considered quite closely related to the subtribe Lachnina but differing from it in specialization of body form, cornicles, and eyes. The other subtribes of the Lachnini have quite a different wing structure. While the radial sector has changed its position considerably from that found in the fossils it has not reached the tip of the stigma and is not straight, but much curved. In this regard, therefore, the Pterochlorina is perhaps the most primitive subtribe in the Lachnini, although in many respects it is specialized. On the other hand there are two highly specialized subtribes, the Anoecina and the Tramina. It is usually the custom to place the Anoecina with the Pemphigina. Its relations, however, are here. The adult forms are very similar indeed to the lachnids. The sexual forms, on the other hand, are small and apterous and suggestive of the sexes of the Eriosomatinae, and there is considerable ground for placing the Anoecina there. These sexual forms, however, seem to differ quite distinctly from those of the Eriosomatinae, which are beakless and the oviparous female of which never develops more than one egg. The development of the stigma shows quite an extreme modification from the long, narrow, primitive stigma.

Near this same line of development is the rather highly specialized subtribe Tramina. The most marked character of this subtribe is the extreme modification of the hind tarsi. In considering only the genus Trama it might be thought that the tribe should belong with the Eriosomatinae. The species *troglodytes* has often been figured with cornicles in the apterous form. Specimens from Mordwilko and Schouteden determined as this species lack them and the writer therefore considers Trama as the most specialized genus in the subtribe. Another genus represented by *radicis* Kalt. shows cornicles very large and of a typical Lachnus character. Through this genus, therefore, the subtribe can be placed at once with its relatives in the Lachnini. Apart from the peculiar tibial character this genus is very lachnid-like.

The next branch from the Aphidinae is the Callipterus branch, which may be considered as arising somewhat later than the Lachnus branch. From this offshoot soon after it arose and before the present genera of the Callipterini appeared the Thelaxini separated.

This tribe, the old Vacuini, also has usually been placed with the Eriosomatinae. There are some resemblances, it is true; only one egg, for instance, is usually laid by the sexual female. But this is not always the case, for, according to Buckton, more than one egg is sometimes laid. Such a condition shows that the one egg habit is of much more recent development than in the Eriosomatinae. Moreover, the sexual female is very different in structure. She is not the

degenerate, beakless, nonfeeding individual of the Eriosomatinae, but feeds upon the leaf like the viviparous forms. Moreover, in external structure these insects resemble certain ones of the Callipterini, to such an extent, indeed, that Davidson has described one of these forms as a Chaitophorus. Certain of the structures met with in these forms resemble those found in the Hormaphidinae and on these structures the tribe might be placed there. The writer believes, however, that the true affinities of the tribe are shown by comparison with the Phyllaphidina. It will be seen at a glance that there is a very close resemblance in all main characters. But the sexual forms are different, although not so strikingly different as would appear at first. In the Phyllaphidina both winged and wingless ovipara and as a rule winged males occur. But in some species (*quercifoliae*) intermediate and apterous males also occur. It is not a very long call, therefore, from the apterous males and females of the Phyllaphidina to the apterous sexes of the Thelaxini. But the habit of egg laying met with in this last tribe shows that it has been on this course of development longer than has the Phyllaphidina. The group is therefore considered as a tribe which has separated somewhat earlier and yet has paralleled in some ways certain characters of the Phyllaphidina.

Continuing with the Callipterus branch we find two somewhat similar lines of development, the one represented by the Callipterina and the other represented by the Chaitophorina. Both are similar in many regards, but are quite different in the armature, particularly of the antennæ.

The first subtribe separating from that offshoot represented by the Callipterina is the Phyllaphidina. This seems evident from the fact that the oviparous forms of some species are yet alate, a primitive condition found very seldom in the Aphididae. The next offshoot resulted in the Callipterina where the oviparous forms are apterous, the cornicles of moderate development, and the wing veins usually not reduced. From this offshoot the Saltusaphidina evidently arose. This little subtribe is closely related to the Callipterina in many ways, but there are some new developments. In the first place the power of leaping has become developed by the enlarging of the femora. Secondly, both the sexual forms have lost their wings, which the male usually retains in the Callipterina. One of the most important points, however, is the fact that in the Saltusaphidina the ocular tubercles which represent the retained larval eyes are absent, whereas they are quite conspicuous in the Callipterina.

On this same Callipterus branch, but somewhat more specialized than the Callipterina, are two subtribes. These have specialized in opposite directions, the one toward the elimination of the cornicles

and the other toward the development of them. The first subtribe, the Monaphidina, lacks cornicles above. The second of these two, the Drepanaphidina, possesses them in varying degrees. In this last subtribe the males are winged, and the females have developed an extremely long, narrow ovipositor.

Coming now to that line represented by Chaitophorus, the Chaitophorina are found to be the most generalized, corresponding quite closely with the Callipterina. In this subtribe males are winged as a rule, but sometimes in the same species they are intermediate or apterous. Arising from the same branch with the Chaitophorina are two subtribes specialized in different directions, like the subtribes of Callipterus. The first, Fullawayina, lacks cornicles entirely, whereas the Pterocommina has developed them in varying degrees, as has the Drepanaphidina. This concludes the subtribes of the Callipterus branch.

In connection with these insects the tribe Greenideini should be considered. The cornicles of the primitive aphids were evidently small, somewhat rounded or conical, and armed with hairs. In the Greenideini the insects have very long cylindric or somewhat swollen cornicles which are thickly covered with prominent hairs. No such well-developed cornicles are met with in any of the other tribes of the family, although they are approached in the Macrosiphina. In this latter subtribe species occasionally occur which show a few short hairs on the cornicles. It seems evident then that the Greenideini separated from the Aphidinae before the hairs of the cornicles disappeared. This was evidently more recent than the development of the tribe Lachnini which possesses a much more primitive cornicle. At about the same time that the ancestors of the Callipterini separated from the Aphidinae, other forms probably separated and more or less paralleled in some ways the ancestors of the Macrosiphina, but unlike them carried the hairs of the cornicles. They thus resulted in forms with very long cornicles similar to those of the Macrosiphina but armed with long hairs. In other characters, too, they of course differ, particularly in regard to the cauda.

In considering the further development of the Aphidinae, a more or less distinct development of the cornicles and antennal tubercles is found. There are thus two types which separate themselves, represented by Aphis and Macrosiphum respectively. These may be considered as leaving the aphid line at about the same time after the development of prominent cornicles. There are, consequently, two subtribes, the Aphidina and the Macrosiphina. The Cervaphidina represents a group of insects armed with long, somewhat cylindric cornicles, and very prominent spinelike protuberances. The number of antennal segments is somewhat reduced, as is also the wing venation. It seems evident then that this is a subtribe on somewhat the

same line of development as the Aphidina but developing these specialized spines during the same period in which the wings and antennæ have become reduced. Still another subtribe, the Pentalonina, shows a very peculiar wing venation. This is not so much a primitive wing as a more specialized one. It is placed, therefore, as one of the highest subtribes of the Aphidini.

There remains yet for discussion the tribe Setaphidini. This, it seems evident, belongs with the Aphidinae. In regard to the antennæ and the wings it is quite highly specialized but in regard to the cornicles, cauda, and anal plate this statement can not be made. The natural position of this tribe is somewhat doubtful. Its ancestors evidently separated from the aphidian line before the prominent cornicles of the Aphidina, Macrosiphina, etc., appeared and yet the species are more specialized in many ways than are members of those subtribes. It would appear that the lines separated after that of the Greenideini, for the cornicles are not hairy. Yet this separation must have taken place a considerable time before that of the Aphidina and Macrosiphina. The tribe is placed, therefore, as indicated in the diagram (fig. 1).

The subfamilies, other than the Aphidinae, include the most specialized members of the family. By far the most primitive of these subfamilies is the Mindarinae. This subfamily, as has been indicated, is a remnant from the past, giving some idea of the ancestors of the Eriosomatinae and the Hormaphidinae. The wing structure is particularly worthy of study. The wing of no other living aphid is like it, but this peculiar structure is abundantly met with in fossil forms. The media, it is true, is more reduced than in certain members of the Aphidinae, but this is of very little importance as compared with the wing's peculiar structure. The form also feeds upon conifers and this is undoubtedly a primitive habit. The cauda and anal plate are unlike those met with either in the Eriosomatinae or the Hormaphidinae.

The sexual forms are interesting. They have become sufficiently specialized toward the Eriosomatinae to have lost the wings, but they retain the beak, at least in most individuals, and feed. The ovaries of the oviparous female also are developed so that a number of eggs are laid.

The two remaining subfamilies are the most highly specialized of all aphids.

The Eriosomatinae are in many ways more specialized than the Hormaphidinae, but in other ways they are more primitive. The whole Eriosoma line separates at once on the sexual forms. These are small, apterous, and beakless. Throughout their life they take no nourishment, and the ovaries of the oviparous female become atrophied, so that only one develops and of the eggs therein only one

reaches maturity. The most primitive tribe on this line is the Eriosomatini. The forms of this tribe are not as a rule distinct gall formers. They possess rather prominent cornicles and have developed special wax glands. They live as a rule upon deciduous trees, the summer forms of many species alternating upon the roots of plants.

More specialized than the Eriosomatini are the Pemphigini, which, however, are very similar to the former in many respects. These are distinct and true gall formers on deciduous trees. For part of the year they are usually altogether closed within the gall. Wax secretion is common and the cornicles are present, but reduced to mere rings.

The Melaphini are closely related to the Pemphigini and are gall formers like them. These forms, however, have lost entirely the cornicles which are usually still retained in the Pemphigini.

A somewhat different specialization is met with in the Prociphilini. Here wax secretion has developed at the expense of the cornicles so that these organs are absent, at least in nearly all the forms of the species. Large wax plates have taken their places. The species are not true gall formers, but live upon foliage which they cause to roll or crumple into a pseudogall. Development along this line is also present in the next tribe, the Fordini.

Here the cornicles are also absent, being replaced by large wax glands, but the species are nearly all root feeders and are usually associated with ants, often living with them in their nests. This tribe may be considered the most specialized of all the Eriosomatinae.

The same specialization in the sexual forms has not occured in the Hormaphidinae. They are small and apterous, it is true, but they possess beaks, they feed, and the oviparous female lays more than one egg. In one regard, however, these insects are more specialized. Many of them have developed a pecular aleyrodiform stage, which is quite different from anything occuring elsewhere in the family. Along with this development peculiar wax glands have made their appearance so that some of these forms look very much like aleyrodids and are indeed often mistaken for them.

The most primitive tribe here is the Oregmini, which, although it possesses many of the other characters met with in these forms, lacks the aleyrodiform stage. These insects possess quite distinct cornicles.

Closely related to the Oregmini is the Cerataphidini. These insects likewise possess cornicles and in several ways suggest the Oregmini, but they have developed a distinct aleyrodiform stage and in this regard are much more advanced than the members of that tribe.

Lastly, and perhaps most specialized of all, are the Hormaphidini. These insects are curious gall formers, not only on their primary host, but often on their secondary one as well. They lack cornicles and

have developed aleyrodiform generations and wax secreting structures. In many ways the specialization of these insects is most remarkable.

KEY TO THE SUBFAMILIES OF THE APHIDIDAE.

1. Sexual forms small with functioning mouth parts absent. Oviparous female with all the egg tubes present or indicated in the embryo but the adult possessing only one tube and maturing one cell so that one egg only is laid. Cornicles much reduced or absent. Wax glands abundantly developed. Wing veins usually reduced. Antennal sensoria prominent.....ERIOSOMATINAE.
   Sexual forms with functioning mouth parts. Nearly all the ovarian tubes developed in the adult oviparous female..... 2.
2. Radial sector of forewing inserted mesad of the stigma. Sexes small. Oviparous female laying several eggs.....MINDARINAE.
   Radial sector not so inserted but arising from the stigma..... 3.
3. Forms usually gall makers. Wing veins much reduced so that the media is usually simple. Wax glands usual. Antennal sensoria annular. Aleyrodiform stages common. Sexes wingless as a rule and small..HORMAPHIDINAE.
   Forms not usually gall makers. Wing veins often not reduced. Wax glands not abundant. Antennal sensoria oval or subcircular. Aleyrodiform stages rare. Cornicles often little reduced. Winged males common. APHIDINAE.

Subfamily I, APHIDINAE.

The subfamily Aphidinae contains many of the most primitive insects in the family. Indeed, with the exception of the Mindarinae the subfamily may be considered as by far the most primitive.

The oviparous female, in all the tribes, develops the ovaries in a normal way and lays several eggs. An exception to this, however, is the Thelaxini, but here two or more eggs are sometimes laid. The males may be either alate, apterous, or intermediate, and in many species which possess the migratory instinct they are often produced on quite a different food plant from the oviparous form. The stem mothers are in practically all cases apterous, but the remaining generations throughout the year may or may not be winged. In many species a larger percentage of winged forms occurs in certain generations and a larger percentage of apterous forms in others. In some species, however, this does not appear to be the case. In certain of the Callipterini practically all of the viviparous forms other than stem mothers are winged.

The insects are mainly foliage feeders, but they also attack the stems and roots. They occur both upon woody plants and herbs. Their feeding may have little apparent effect upon the host or it may cause distortions or pseudogalls. Some species are particularly injurious to their hosts and when these are economic plants cause much loss.

Great variation is met with amongst the members of the subfamily. The antennæ are rather long and slender and as a rule are armed with subcircular sensoria. In most of the forms the sixth segment

possesses an elongate narrow unguis, which in some of the Callipterini and Aphidini is remarkably developed. In the more primitive groups, however, this is short and thumb-like. The head of the apterous form differs much from that seen in the Eriosomatinae, in that true compound eyes are present and often very prominent, and the small larval eyes are seen as ocular tubercles. It is noteworthy that in the Eriosomatinae the alate forms possess distinct compound eyes but the apterous forms have lost them. The wings are in general quite similar throughout the family in regard to the venation. In color, shape, and location of the veins there is often considerable difference. Moreover, there are a few genera amongst the different tribes which show abnormal wing form, of which genera Microparsus is a good example. In the typical forms of this subfamily the media of the fore wing is twice branched, but it is very commonly branched only once and it is rarely simple.

The cornicles show remarkable variation. In some forms of the Callipterini they are short and slightly swollen at the base, in the Lachnini they are low broad cones, whereas in the Greenideini they are cylindrical and sometimes longer than the body. Between these extremes every gradation occurs. The cornicles may be straight or they may be swollen to a greater or less degree. Practically all forms eject a colored wax from these organs when disturbed.

The cauda shows almost as much variation as the cornicles, sometimes being short and rounded, in other cases elongate, spatulate, or conical, and in others distinctly knobbed. Variation also is met with in the anal plate, though this usually is rounded, In the Callipterini, however, it is often bilobed.

The tribes of the subfamily may be separated as follows:

KEY TO THE TRIBES OF THE APHIDINAE.

1. Cornicles situated on broad flat cones ..... 2.
   Cornicles truncate, or more or less elongate ..... 3.
2. Cornicles and antennæ hairy. Antennæ with the unguis short and thick .. LACHNINI.
   Cornicles and antennæ not hairy. Antennæ with the unguis long and slender ..... SETAPHIDINI.
3. Cornicles clothed with long hairs ..... GREENIDEINI.
   Cornicles never with long hairs ..... 4.
4. Thorax of alate form with the lobes not prominently developed; oviparous form small, often laying one egg. Large wax plates present ..... THELAXINI.
   Thorax of alate form with the lobes prominently developed; oviparous female laying several eggs. Large wax plates usually absent ..... 5.
5. Cornicles truncate or elongate; when elongate the cauda knobbed, and the anal plate bilobed, or the antennæ prominently hairy ..... CALLIPTERINI.
   Cornicles not truncate, usually elongate. Cauda never knobbed. Antennæ with only a few spinelike hairs ..... APHIDINI.

Tribe LACHNINI.

The tribe Lachnini is the most primitive of all living aphids, with the exception of the Mindarinae. The genus Mindarus shows in its wing structure characters more primitive than any of the Lachnini, but in other characters such as those of the beak, cornicles, cauda, sensory structures, etc., the Lachnini are very primitive insects. In examining the fossil wings it is to be noted that the radial sector is situated back of the stigma. In practically all living aphids, with the exception of Mindarus, this vein has migrated toward the tip of the wing. In primitive forms the stigma is long and narrow, whereas in most living forms it has become more or less compact. In the subtribe Lachnina the radial sector has become a very short, straight vein almost at the tip of the wing. This shows that the Lachnina are evidently more advanced than the Pterochlorina in which the radial sector is somewhat curved and situated near the middle of the stigma. The subtribe Eulachnina is considerably specialized, as indicated by the eyes, the shape of the body, and the cornicles. It is, however, as closely related to the Lachnina as are any of the other tribes, as will be seen from the formation of the wing. The Anoecina in the typical genus shows a wing with a short blocky stigma, a condition quite different from that seen in the Lachnina, and the radial sector is here curved. (In Nippolachnus, however, the stigma is still long and straight.) Moreover, the sexual forms are more specialized, being apterous in both cases. Anoecia, therefore, is somewhat removed from Lachnus. The genus Trama is considerably specialized, in that it lacks cornicles in the apterous form. It is, however, related to Lachnus through Neotrama with small cornicles, and Protrama with large hairy cornicles.

The rostrum in the Lachnini is in many species five-segmented, a primitive character most marked in this group. The freshly emerged wing of a lachnid shows that M_1, M_2, and M_{3+4} are the veins represented when the media is twice branched, and that in some species no vein is formed about M_2. The cubitus and first and second anal are present in the forewing. As in other Aphididae, however, no vein forms about the second anal. The radial sector is in Lachnus a short, straight trachea and a prominent vein forms about it. The stigma, as in all members of the family, is formed by $radius_1$. In the hindwing both media and cubitus are present and form distinct veins.

The antennæ of the Lachnini are six-segmented with a short unguis. They are usually armed with oval or subcircular sensoria and prominent hairs. In fact, the entire body of the insect is hairy.

The cornicles are characteristic. They are situated on distinct cones which are constricted before the somewhat flanged opening which is not situated over the center of the cone. The cones are arm-

ed with hairs. Some specialized forms have small cornicles or none at all. Wax-secreting structures, but no distinct gland areas, are present in this tribe and a coating of fine wax is often found over the entire insect, including the appendages. This is true of the oviparous forms, as well as of the viviparous ones.

The cauda and anal plate are here rounded, never developed into elongate structures as in some of the other tribes of the subfamily. The sexual forms are nearly as unspecialized as the viviparous ones. Both sexes possess a distinct rostrum and take food. The males in the typical subtribes are winged. The females are apterous, but the ovaries are developed and several eggs are laid by each individual.

KEY TO THE SUBTRIBES OF THE LACHNINI.

1. Radial sector of fore wings curved and of moderate length..... 2.
   Radial sector of fore wings short and straight, situated near the tip of the wing..... 4.
2. Hind tarsi extremely elongate, head divided, wing venation usually faint. TRAMINA.
   Hind tarsi normal..... 3.
3. Stigma short and thick, sexes both apterous.....ANOECINA.
   Stigma elongate, males often winged.....PTEROCHLORINA.
4. Form elongate and very narrow; antennæ with bristles, cornicles not hairy; eyes without ocular tubercles.....EULACHNINA.
   Form not elongate; cornicles on hairy cones; eyes with ocular tubercles..LACHNINA.

Subtribe ANOECINA.

The subtribe Anoecina is suggestive of the Tramina, but none of the forms are as specialized as some of the genera of that subtribe. The typical genus is quite distinctive in the short rounded stigma and in the sexual forms. The genus Nippolachnus, however, has a stigma quite Lachnus-like in appearance. Only two genera are known at present.

KEY TO THE GENERA OF THE ANOECINA.

1. Head not divided; eyes with prominent ocular tubercles; stigma of wing short and rounded.....Anoecia.
2. Head divided; eyes without ocular tubercles; stigma long and straight. Nippolachnus.

Genus ANOECIA Koch.

Plate I, A–F, I.

1857. *Anoecia* Koch, Die Pflanzenläuse Aphiden, p. 275.

Characters.—Head not divided, front somewhat rounded. Eyes prominent but not distinctly set off from the head. Antennæ of six segments, armed with subcircular or oval or elongate sensoria and covered with hairs. Fore wings with the media once branched. Stigma short and thick. Hind wings with both media and cubitus present. Cornicles situated on broad hairy cones. Cauda and anal plate somewhat rounded.

Spring forms free, living in colonies; summer forms often subterranean. Sexes small and apterous, possessing beaks and feeding. Oviparous female laying one or more than one egg.

Type (monotypical), *Aphis corni* Fab.

Genus NIPPOLACHNUS Matsumura.

Plate I, G, H, J, K.

1917. *Nippolachnus* Matsumura, Journ. Coll. Agr. Tohoku Univ., v. 7, pt. 6, p. 382.

This genus is closely related to Anoecia Koch and yet it retains many Lachnus characters which are not present in Anoecia. It is separated from that genus by several important points. The head is distinctly divided as it is not in Anoecia. The stigma is long and Lachnus-like and the eyes have not the small prominent ocular tubercles of Anoecia, but are rounded on their posterior margins.

Characters.—Antennæ of six segments, armed with prominent protruding sensoria and many hairs; head divided; eyes without prominent ocular tubercles. Wings with the media once branched, the stigma rather long and narrow. Cornicles on large broad cones entirely covered with hairs.

Spring forms free, migrating in summer to alternate hosts. Sexes small, males winged.

Type (fixed by Matsumura, 1917), *Nippolachnus piri* Mats.

Subtribe EULACHNINA.

The subtribe Eulachnina is related to the Lachnina quite closely, as can be seen by the wing structure where the radial sector is a straight, short vein extending across the tip of the wing. The media also is faintly indicated. In the other branch of the tribe in which the Anoecina and Tramina are found, the radial sector is curved as it is in Aphidina, etc. Members of the Eulachnina may, however, be separated at once from the Lachnina on the elongate, narrow shape of the body, the abruptly rounded cauda, the character of the cornicles, and the absence of ocular tubercles upon the eyes. The subtribe is evidently quite specialized as compared to the Lachnina.

Characters.—Eyes large and set off from the head; ocular tubercles not evident; antennæ slender, armed with bristles or spines, not slender hairs. Cornicles shallow, not on distinct hairy cones. Cauda abruptly rounded. Body very elongate and slender, scarcely wider than the head.

Key to the Genera of the Eulachnina.

1. Antennæ of five segments, armed with minute bristles.....Essigella.
   Antennæ of six segments..... 2.
2. Media once branched, antennæ with long stout spines.....Eulachnus.
   Media twice branched.....Todolachnus.

Genus ESSIGELLA Del Guercio.

Plate I, S–Y.

1909. *Essigella* Del Guercio, Rivista Patol. Vegetale, n. s., v. 3, p. 329.

The genus Essigella is quite similar to Eulachnus with the exception of the antennæ.

Characters.—Head with large outstanding eyes, very much broader than long. Antennæ of five segments, imbricated, armed only with a few minute bristles. Fore wings with the media faintly indicated, once branched, hind wings with both media and cubitus present. Cornicles chitinized rings situated close to the body, no hairy cones present. Cauda rounded. Body elongate and narrow.

Type (monotypical), *Lachnus californicus* Essig.

Genus EULACHNUS Del Guercio.

Plate I, L–R.

?1853. *Cinaria* Curtis, British Entomology, v. 12, section 576.
1909. *Eulachnus* Del Guercio, Rivista Patol. Vegetale, n. s., v. 3, p. 329.
1915. *Protolachnus* Theobald, Bull. Ent. Res., v. 6, p. 145.

Del Guercio erected the genus Eulachnus without setting a type, but Wilson [1] has indicated *agilis* Kalt. as the type. Apparently, therefore, the genus must be based upon that species. Theobald's genus was based on his *tuberculostemmata*, a species in which the characters are the same. Cinaria was erected with *pini* L. as type, but this was questioned.

Characters.—Head divided, eyes rather large and outstanding; antennæ of six segments, armed with long stout bristles. Fore wings with the media faintly indicated and once branched; hind wings with both media and cubitus present but faint; cornicles minute rings, not situated on hairy cones. Cauda abruptly rounded. Body elongate and narrow.

Type (fixed by Wilson, 1911), *Lachnus agilis* Kalt.

Genus TODOLACHNUS Matsumura.

1917. *Todolachnus* Matsumura, Jour. Coll. Agr. Tohoku Univ., v. 7, pt. 6, p. 381.

The writer has been unable to study the type of this genus, but from the description given it seems to represent a genus belonging here and having a twice-branched media. The description of the cornicles as "wart-like, not broader at base" would indicate its affinities here, also the words "body long, nearly parallel on the lateral sides."

Type (fixed by Matsumura, 1917), *Todolachnus abietis* Mats.

Subtribe LACHNINA.

The members of the subtribe Lachnina may be separated from those of other subtribes with the exception of the Eulachnina by the character of the venation. The radial sector here has almost reached the tip of the wing and become a short straight vein. The genera may be separated as follows:

KEY TO THE GENERA OF THE LACHNINA.

1.	Media of fore wings twice branched	Dilachnus.
	Media not twice branched	2.
2.	Media once branched	3.
	Media simple	Unilachnus.
3.	Labium lance-like	Lachnus.
	Labium obtuse	Schizolachnus.

Genus LACHNUS Burmeister.

1835. *Lachnus* Burmeister, Handbuch der Ent., v. 2, pt. 1, p. 91.
1909. *Lachniella* Del Guercio, Redia, v. 5, p. 286.

The genus Lachnus Burmeister was erected with the following included species: *lapidarius* Fab., *fagi* Linn., *quercus* Linn., *fasciatus* Burm., and *punctatus* Burm.

Of these species the following were removed as types of other genera: *fagi*, 1857, *Phyllaphis*, and *quercus*, 1870, *Stomaphis*.

[1] Wilson, H. F. Notes on the synonymy of the genera included in the tribe Lachnini. *In* Ann. Ent. Soc. Amer. v. 4, p. 51–54, 1911.

The following type fixations have been made for Lachnus:

1840. *Aphis roboris* Linnaeus, Westwood.
1863. *Lachnus pinicola* Kaltenbach, Passerini.
1908. *Aphis nudus* De Geer, Mordwilko.
1910. *Lachnus punctatus* Burmeister, Wilson.
1911. *Lachnus fasciatus* Burmeister, Wilson.

Now the first three fixations are invalid, since the species were not included in the original genus. The first valid fixation, therefore, is that of Wilson, 1910, when he set *punctatus* as type. This fixation, according to present rules, can not be changed in 1911 because it is an unfortunate fixation, but *punctatus* must remain the type of the genus Lachnus. The question is now purely zoological. At present *punctatus* is unknown and, therefore, the genus Lachnus must remain unknown until *punctatus* is discovered. This is the situation, if the rules are followed, and the well-known genus name will be lost to us. At the suggestion of numerous aphid workers we are holding *fasciatus* as the type of Lachnus and the Commission will be asked to suspend the rules in this case on account of the long usage of the name Lachnus.

In 1909 Del Guercio erected the genus Lachniella without setting a type but in 1911 Wilson interpreted this genus as Lachnus with *fasciatus* Burm. as type. Following this the writer definitely designated this species as type. Therefore, Lachniella will become a synonym of Lachnus.

Characters.—Eyes large, with distinct ocular tubercles present. Antennæ of six segments and with rather prominent hairs. Cornicles on somewhat shallow hairy cones. Fore wings with the radial sector short and straight; stigma elongate; media once branched. Labium lance-like.

Type (by suspension of rules), *fasciatus* Burm.

Genus DILACHNUS Baker.

Plate II, A–C.

1919. *Wilsonia* Baker, Can. Ent., v. 51, p. 212.
1919. *Dilachnus* Baker, Can. Ent., v. 51, p. 253.

Characters.—Eyes with distinct ocular tubercles. Antennæ of six segments and armed with slender hairs and circular sensoria. Cornicles on rather broad hairy cones. Fore wings with radial sector straight, media twice branched; hind wings with both media and cubitus present.

Type (fixed by Baker, 1919), *Lachniella gracilis* Wlsn.

Genus SCHIZOLACHNUS Mordwilko.

Plate II, D.

1908. *Schizolachnus* Mordwilko, Ann. Mus. Zool. l'Acad. Imp. des Sci., St. Petersbourg, v. 13, p. 375.

The genus Schizolachnus was erected by Mordwilko with *tomentosus* De Geer (*pineti* Fab.) as type.

Characters.—Eyes large and with ocular tubercles present. Antennæ of six segments and with rather prominent hairs. Cornicles on somewhat shallow hairy cones. Fore wings with the radial sector straight; stigma elongate; media once branched. Labium obtuse.

Type (fixed by Mordwilko, 1908), *Aphis tomentosus* De Geer.

Genus UNILACHNUS Wilson.

Plate II, E-G.

1919. *Unilachnus* Wilson, Ent. News, v. 30, p. 5.

The genus Unilachnus Wilson appears to be a connecting link between this subtribe and the Eulachnina. In some respects the genus is very suggestive of that subtribe. The form is elongate and the cornicles are reduced. They are armed, however, with hairs and are not so reduced as in the Eulachnina. The ocular tubercles here are very rudimentary, almost absent, and in this regard, too, the genus suggests the Eulachnina, but it seems to belong in this subtribe.

Characters.—Form elongate; cornicles somewhat reduced; ocular tubercles small; media of fore wings simple. Antennæ of six segments moderately armed.

Type, *Lachnus parvus* Wilson.

Subtribe PTEROCHLORINA.

The genera belonging in the subtribe Pterochlorina are in some ways more primitive than those of the Lachnina, but in other respects some of them are more specialized. The radial sector of the fore wings is still curved and in some genera quite elongate. This is much nearer the early type of wing than is the wing of the Lachnina where the radial sector is short and has migrated almost to the tip of the wing. Of course, the distinct curving of this vein found in some of the genera is an advance on the slightly curved elongate vein usually met with in the fossils, but to our mind the location and character of this vein are much more primitive than in the Lachnina. The stigmal area and the sexual forms appear considerably more primitive than in the Anoecina, the specialization of which has been in a different direction from that of the Lachnina. The male of Stomaphis is, however, an exception.

Characters.—Head often divided; antennæ of six segments, armed with hairs and subcircular sensoria. Fore wings with radial sector somewhat curved and not close to the tip of the wing. Cornicles on broad hairy cones. Males usually winged.

Key to the Genera of the Pterochlorina.

1. Stigma extending along costal margin almost to the tip of the wing..Longistigma.
   Stigma not so extending.....2.
2. Beak extremely long, very much longer than body; antennæ covered with very fine, short hairs.....Stomaphis.
   Beak normal in length; antennæ with rather stout hairs, often quite long.....Pterochlorus.

Genus LONGISTIGMA Wilson.

Plate II, H-L.

1909. *Longistigma* Wilson, Can. Ent., v. 41, p. 385.
1909. *Davisia* Del Guercio, Redia, v. 5, p. 185.

The genus Longistigma Wilson can be distinguished at once by the shape of the stigma which is drawn out at the tip to an acute point which extends almost to the tip of the wing. The type species is

very large, one of the largest aphids. Del Guercio set no type for his subgenus which was published shortly after Wilson's. Wilson placed this species as a synonym of *caryae* Harris which he made the type of Longistigma.

Characters.—Size large. Head somewhat divided. Eyes large, with distinct ocular tubercles. Antennæ of six segments, armed with subcircular sensoria and prominent hairs. Fore wings with media twice branched, radial sector not a great way from the tip of wing and stigma extending around almost to tip; hind wings with both media and cubitus present. Cornicles on broad, shallow, hairy cones. Cauda and anal plate somewhat rounded.

Oviparous female apterous. Males winged.

Type (monotypical), *Aphis caryae* Harris.

Genus PTEROCHLORUS Rondani.

Plate II, S–X.

1848. *Pterochlorus* Rondani, "Familia Hemipterorum Aphidinæ" in Nuovi Annali delle Scienze Naturali, p. 35.
1855. *Dryobius* Koch, Die Pflanzenläuse Aphiden, p. 225.
1908. *Tuberolachnus* Mordwilko, Ann. Mus. Zool. de l'Acad. Imp. des Sci. St. Petersbourg, v. 13, p. 374.
1909. *Dryaphis* Del Guercio, Redia, v. 5, p. 262.
1913. *Schizodryobius* Van der Goot, Tidj. voor Ent., v. 56, p. 130.
1917. *Pterochlorides* Archangelsky, Turkestan Ent. Stn. Rept. Tashkent.
1918. *Tuberodryobius* Das, Mem. Ind. Mus., v. 6, p. 259.

The generic name Cinaria was used for *Aphis pini* L?, and *Aphis roboris* L. with *A. pini* as type. In the writer's opinion Cinaria can not be used now with *roboris* as type. *Roboris* was used as the type of Dryobius, therefore this name is clear. Dryaphis was used with Pterochlorus as a synonym but the name as a generic name was really first used by Del Guercio in 1909. Tuberolachnus was erected in 1908 with *viminalis* Boyer as type but the difference in the abdominal tubercle is not, in the writer's opinion, sufficient for a distinction. Van der Goot's genus is plainly a synonym. The other two generic names listed were used with *Lachnus persicae* Chol. as type. This species has several abdominal dorsal tubercles but for the same reason as Tuberolachnus is held to be a synonym.

Characters.—Head somewhat rounded. Antennæ of six segments, armed with subcircular sensoria and prominent hairs. Fore wings with radial sector distinctly curved, inserted some distance from tip; media twice branched. Hind wings with both media and cubitus present. Wings often banded or mottled, cornicles on hairy cones. Cauda and anal plate rounded. Abdomen sometimes with dorsal tubercles.

Type (fixed by Rondani, 1848), *Aphis roboris* Fab. (=*roboris* L.).

Genus STOMAPHIS Walker.

Plate II, M–R.

1870. *Stomaphis* Walker, The Zoologist, v. 28, p. 2000.
1881. *Rhynchocles* Altum, Forst Zool., v. 3, p. 356.

Of the five species originally in the genus Lachnus the species *quercus* Linn. was removed by Walker as the type of his genus Stomaphis. Little confusion has arisen in regard to this species. Altum's genus was erected for *Rhynchocles longirostris*.

Characters.—Head slightly rounded; eyes large with distinct ocular tubercles. Antennæ of six segments armed with large subcircular sensoria and thickly covered with fine hairs. Cornicles situated on very broad, shallow, hairy cones. Cauda subconical, slightly rounded. Anal plate rounded. Fore wings with radial sector rather long and somewhat curved. Media twice branched; hind wings with both media and cubitus present, quite widely separated. Beak very long, much longer than body. Males wingless and with rudimentary mouth parts.

Type (fixed by Walker, 1870), *Aphis quercus* Linn.

Subtribe TRAMINA.

The subtribe Tramina is composed of insects quite specialized in nature, subterranean and often associated with ants. The typical genus Trama is the most specialized of all and is in some characters suggestive of the Fordina. Its relations with the other Lachnini, however, are shown clearly by the other genera. The genus Trama, as described by Del Guercio (Redia, v. 5) possesses small cornicles. Specimens of *troglodytes*, however, received from Schouteden, Mordwilko, and others lack cornicles entirely. Some other forms possess them either as very small cones or as large Lachnus-like structures. These latter are evidently the most primitive and to these is given the name Protrama. The insects with small cornicles are grouped under the name Neotrama. The genera may be separated as follows:

Key to the Genera of the Tramina.

1. Apterous form entirely without cornicles and with rudimentary eyes..... Trama.
   Apterous form with cornicles..... 2.
2. Apterous form with large, broad, Lachnus-like cornicles and large distinct compound eyes..... Protrama.
   Apterous form with small cone-like cornicles armed with a few hairs and more or less rudimentary eyes..... Neotrama.

Genus PROTRAMA, n. gen.

Plate III, P–T.

Head divided, front straight, eyes prominent and set off from the head. Antennæ of six segments armed with hairs and small subcircular protruding sensoria. Cornicles situated on broad, low, hairy cones. Cauda and anal plate rounded. Hind tarsi extremely elongate. Wing venation faint; fore wings with the media twice branched; hind wings with both media and cubitus present.

Type, *Trama radicis* Kalt.

Genus TRAMA, Heyden.

Plate III, N.

1837. *Trama* Heyden, Mus. Senkb., v. 2, p. 293.

Head divided but not prominently so, front straight. Apterous form with the eyes reduced to a few facets. Antennæ of six segments; cornicles absent; cauda subconical, rounded. Anal plate rounded. Entire insect minutely hairy.

Type (monotypical), *Trama troglodytes* Heyden.

Genus NEOTRAMA, n. gen.

Plate III, M, O.

Head somewhat flat. In the apterous form the eyes reduced; antennæ of six segments and the cornicles on very small cones with a few scattered hairs. Cauda subconical, rounded. Anal plate rounded. Entire body covered with fine hairs. Hind tarsi greatly elongate.

Type, *Trama troglodytes* Del Guercio (=*Neotrama delguercioi* Baker).

Tribe THELAXINI.

It has been the custom of most writers to place the Thelaxini (Vacuini) in the Eriosomatinae, often possibly because of the fact that only one egg is laid by the oviparous female. But the female is quite different in structure from the beakless females of the Eriosomatinae and the other forms are very different indeed.

With the Hormaphidinae there are more resemblances, the most striking of which is the structure of the thorax. The mesothorax indicates very faintly the lobes so prominent in most forms. The presence of distinct cornicles, however, is very different from the forms in the Hormaphidinae lacking these although possessing a somewhat similar thorax.

The sensory structures, too, are widely different, being similar to those found in the Phyllaphidina. Indeed, the antennæ are very like those of that subtribe. The oviparous forms of the Phyllaphidina, however, lay several eggs and may be either winged or apterous and the males, though sometimes apterous, are usually winged. The venation of the Thelaxini is more reduced than in the Phyllaphidina. Taking all of these facts into consideration it seems evident that the Thelaxini should be placed in the Aphidinae and somewhat related to the Phyllaphidina, a subtribe which belongs in the Callipterini. It is evident, however, that the Thelaxini must stand somewhat apart; it is placed, therefore, as a tribe of the subfamily Aphidinae next to the Callipterini. In this tribe the specialization of the ovipara has advanced beyond that of the Callipterini in that only one egg is laid, but according to Buckton several eggs may be laid and the distinct beak is evidence of relationship.

Characters.—Cornicles present as chitinized rings on shallow hairy cones. Antennæ somewhat setose, with oval or subcircular sensoria. Cauda somewhat semicircular or distinctly knobbed. Body usually armed with hairs or stout spines.

Sexual forms small and apterous, possessing beaks; oviparous female as a rule laying only one egg.

Forms living free upon the foliage.

The genera may be separated by the following key:

KEY TO THE GENERA OF THE THELAXINI.

Cauda distinctly knobbed	Thelaxes.
Cauda not knobbed but somewhat semicircular	Glyphina.

Genus GLYPHINA Koch.

Plate III, G–L

1857. *Glyphina* Koch, Die Pflanzenläuse Aphiden, p. 259.
1911. *Travaresiella* Del Guercio, Redia, v. 7, p. 299.

Characters.—Cornicles present as somewhat elevated rings. Antennæ 5-segmented, minutely setose, armed with a few stout hairs and somewhat subcircular sensoria. Fore wings with the media once branched; hind wings with only the media present. Cauda not knobbed, somewhat rounded, anal plate rounded. Body covered with hairs.

Forms living upon the foliage of plants.

Type (monotypical), *Glyphina betulae* Kalt.

Genus THELAXES Westw.

Plate III, A–F.

Vacuna of authors, not Heyden.
1840. *Thelaxes* Westw., Int. Mod. Class. Ins. Synopsis, v. 2, p. 118.

In 1837, Heyden erected his genus Vacuna based on *coccinea* Heyden. He definitely stated that he thought Phylloxera Boyer was the same genus. Kaltenbach stated that *coccinea* is a Phylloxera and so considered *dryophila* as type of Vacuna, as this species was included in the genus by Heyden. On the authority of Schouteden and other European workers *coccinea* is now considered a Phylloxera and another type, *dryophila*, can not be set for the genus in order to apply Vacuna to the genus as now understood. Vacuna with *coccinea* as type will become a synonym of Phylloxera and another name will be necessary to apply to the genus having *dryophila* as type. The next name used appears to be Thelaxes Westwood.

Characters.—Cornicles present as chitinized rings on broad low cones. Antennæ of the stem mother 5-segmented. Alate form with 3-segmented antennæ, sensoria oval or subcircular. Fore wings with the media once branched, hind wings with the cubitus lacking. Cauda distinctly knobbed, anal plate rounded. Sexual forms small and apterous, possessing distinct beaks and feeding; oviparous female producing normally but one egg.

Type (fixed by Westwood, 1840), *Thelaxes quercicola* Westw.(=*Aphis dryophila* Schr.)

Tribe CALLIPTERINI.

The tribe Callipterini is composed of forms which live upon the foliage of plants. The species in many of the subtribes have developed peculiar habits. Some forms are almost solitary whereas others live in colonies. Some have developed the power of leaping, while others are sedentary. The sexual forms do not vary greatly from the viviparous forms. In nearly all of the subtribes the males are winged, though in the Saltusaphidina they are apterous. In the other tribes intermediate males may occur in the same species with alate males. The oviparous females are nearly always apterous, although in the Phyllaphidina alate ovipara may occur. Both sexes feed and the ovaries of the oviparous female are developed so that several eggs are laid.

The wing veins are not reduced in most species. In some, however, the radial sector of the fore wings is very faint or entirely absent. This condition is met with in several genera of the Callipterina. That it is this vein which is lacking is indicated by the trachea of the freshly emerged wing. Here the media is represented by M_1, M_2, and M_{3+4}. The cubitus and first anal are distinct tracheæ, whereas the second anal is faintly indicated. In the hindwing besides the radial sector three oblique tracheæ are present; these are the media, cubitus, and first anal. Only the media and cubitus are represented in the venation.

Considerable variation is met with in the cornicles of this tribe but they are never long and prominent as in the Aphidini. The usual form is the truncate one represented in Myzocallis, Chaitophorus, etc. Very often the cornicles are sculptured. In some cases they are reduced to small cup-shaped structures and in others they are represented by mere rings.

The antennæ, as a rule, are long and slender and armed with few sensoria. These sensoria are usually small, subcircular or oval. In rare cases they are somewhat elongate.

The cauda in this tribe is as a rule knobbed and the anal plate bilobed. In some cases, however, the cauda and anal plate are both rounded. In the Saltusaphidina the anal plate is divided and the cauda remains distinctly knobbed.

Wax secretion is present to a limited extent in this tribe. It is most developed in the Phyllaphidina. Here there are large lateral abdominal wax plates in all of the forms and the insects present a wool-like appearance on the foliage. In the genus Euceraphis wax secretion is found to a limited extent. In one species, *mucidus* Fitch, it is, however, abundant and the insects of this species often seem to float in the air, a peculiar appearance common also in the Eriosomatinae. In the Saltusaphidina also distinct wax plates occur, particularly in the oviparous forms. These are arranged along the abdominal segments.

The habit of leaping is common in the Saltusaphidina as the name implies. Here the muscles of the femora are greatly enlarged for this purpose. Many of the other members of the tribe approach this condition, especially in the genus Monellia. Others, although they do not distinctly leap, drop so suddenly when disturbed that they almost appear to leap from the foliage. Our common Symydobius on the birch is difficult to collect on account of such a habit and other forms of Callipterina are very similar in action. Certain species in this tribe are closely attended by ants in return for the honeydew excreted. Some species are protected by these Hymenoptera by means of sheds or roofs built over colonies on the leaves or twigs. These sheds are found quite commonly upon the leaves of the oaks protecting the spe-

cies described as *Symydobius albasiphus* by Davis and here placed as Neosymydobius.

The internal structure of insects of this tribe appears not to differ markedly from the structure in other groups. Witlaczil, however, has reported that in certain members of this tribe the intestine forms a closed loop almost similar to that found in the Chermidae.

As a rule, in this tribe, the various forms met with in the subfamily occur. In the genus Monellia, however, in some species at least, apterous viviparous forms seldom occur, nearly all the viviparous forms being alate.

The subtribes may be separated by the following key:

KEY TO THE SUBTRIBES OF THE CALLIPTERINI.

1. Eyes with ocular tubercles present, head not elongate ..... 2.
   Eyes without ocular tubercles present, head often elongate ..... SALTUSAPHIDINA.
2. Antennæ armed with rather long, prominent hairs ..... 3.
   Antennæ usually only with minute, sometimes stout bristles ..... 5.
3. Cornicles absent ..... FULLAWAYINA.
   Cornicles present ..... 4.
4. Cornicles cylindrical or vasiform ..... PTEROCOMMINA.
   Cornicles truncate, enlarged at base ..... CHAITOPHORINA.
5. Cornicles absent above ..... MONAPHIDINA.
   Cornicles present, position as usual ..... 6.
6. Cornicles reduced to mere rings; large lateral abdominal wax plates present ..... PHYLLAPHIDINA.
   Cornicles usually not reduced to mere rings; no large abdominal wax plates present ..... 7.
7. Cornicles variable, often long and somewhat swollen; oviparous female with an elongate ovipositor ..... DREPANAPHIDINA.
   Cornicles never long; always short and truncate; oviparous female not always with an elongate ovipositor ..... CALLIPTERINA.

Subtribe PHYLLAPHIDINA.

The subtribe Phyllaphidina is erected for the species related to the genus Phyllaphis. Many of the characters show these species as quite closely related to the Callipterina, while in other ways they very strongly suggest the Thelaxini, as indicated under the discussion of the tribe.

Characters.—Cornicles present; antennæ of six segments, minutely setose, sensoria elongate or subcircular; cauda knobbed or rounded, anal plate often bilobed, wax glands present. Forms living free or in pseudogalls. Sexual forms often alate, sometimes, however, apterous or intermediate, showing that the apterous condition has developed but recently; oviparous female producing several eggs.

KEY TO THE GENERA OF THE PHYLLAPHIDINI.

1. Anal plate deeply cleft and U-shaped ..... Shivaphis.
   Anal plate entire or somewhat bilobed, not deeply cleft ..... 2.
2. Cauda rounded, anal plate entire ..... 3.
   Cauda knobbed, anal plate somewhat bilobed ..... Phyllaphis.
3. Oviparous females with annular sensoria ..... Neophyllaphis.
   Oviparous females with small transverse sensoria ..... Tamalia.

Genus NEOPHYLLAPHIS Takahashi.

1920. *Neophyllaphis* Takahashi, Can. Ent., v. 52, p. 20.

Characters.—Cornicles slightly elevated. Antennæ of six segments, with narrow, transverse sensoria. Fore wings with media twice branched, hind wings with both media and cubitus present. Cauda and anal plate rounded, cauda sometimes slightly constricted. Oviparous females winged and possessing annular sensoria. Forms wax secreting and living free on the plants.

Type (monotypical), *Neophyllaphis podocarpi* Takahashi.

Genus PHYLLAPHIS Koch.

Plate IV, FF, GG.

1857. *Phyllaphis* Koch, Die Pflanzenläuse Aphiden, p. 248.

The well-known genus Phyllaphis Koch is represented by *fagi* L., but as indicated under Tamalia has been made to include species of somewhat different structure.

Characters.—Cornicles present as chitinized rings which are very slightly elevated on low conical bases. Antennæ of six segments, long and slender, minutely setose, sensoria narrowly oval. Fore wings with the media twice branched; hind wings with both media and cubitus faintly indicated. Cauda knobbed, anal plate slightly divided.

Forms living upon the foliage, sometimes producing a curling of the leaves. Males usually winged; oviparous form apterous, producing several eggs.

Type (monotypical), *Aphis fagi* L.

Genus TAMALIA n. gen.

Plate IV, HH, II.

The genus Tamalia Baker is erected for *Pemphigus coweni* Ckll., a species which has since been placed in Phyllaphis. It is, however, quite distinct from the type of the genus and undoubtedly represents a new genus. Mr. Theodore Pergande received this species, *coweni*, from California and made some notes on the material, thinking, however, that it was a new species. He gave it a provisional name and the new generic name here used. This name, as far as our knowledge goes, never was published. Among the large number of new genera conceived by Pergande this is one of the few valid ones and his manuscript name, therefore, is used here.

Characters.—Cornicles present as mere flanges on low, broad, conical bases. Antennæ of six segments minutely setose and with narrow sensoria. Fore wings with media once branched, hind wings with both media and cubitus present. Cauda and anal plate both rounded. Abdominal wax plates present.

Forms living in pseudogalls. Sexes sometimes both winged, oviparous form producing several eggs.

Type, *Pemphigus coweni* Ckll.

Genus SHIVAPHIS Das.

1918. *Shivaphis* Das, Mem. Ind. Mus., vol. 6, p. 215.

The genus Shivaphis was erected with *celti* Das as type, and *celti* is evidently the species redescribed as *Chromaphis celticolens* by Essig.[1]

[1] Essig, E. O., and Kuwana, S. I. Some Japanese Aphididæ. *In* Proc. Cal. Acad. Sci., v. 8, no. 3, p. 95, 1918.

The writer has studied a series of specimens of this species taken in 1907 on *Celtis sinensis*. There seems little doubt that the genus is related to Phyllaphis. The dorsal wax glands are of much the same structure as those found in *fagi* L. The deeply cleft anal plate, however, at once separates the two. The cauda which is almost cylindrical in some specimens is quite distinctly knobbed in others.

Characters.—Cornicles present as mere rings. Head without prominent antennal tubercles. Antennæ of six segments, sensoria elliptical. Fore wings with the media twice branched, hind wings with both media and cubitus present. Cauda cylindrical or knobbed. Anal plate deeply divided. Males winged. Oviparous females apterous. Rows of wax glands present.

Type (monotypical), *Shivaphis celti* Das.

Subtribe CALLIPTERINA.

The subtribe Callipterina is a somewhat large and interesting one. Some of the species are very large and more or less solitary, others are small and live in colonies. In some genera apterous viviparous forms, with the exception of the stem mother, seldom occur, while in other genera they are as a rule, present. The males are in most cases alate and the oviparous forms apterous. The species of nearly all the genera live upon the leaves of plants. They do not affect these greatly, as a rule, although when abundant the insects often seriously interfere with the proper development of the trees attacked. Many of the insects are armed upon their bodies with prominent spines or tubercles.

Characters.—Cornicles present, truncate in form. Antennæ with setæ or spines, of six segments, and armed with subcircular or in a few cases somewhat elongate sensoria. Wings often clouded, mottled, or banded. Cauda as a rule knobbed, anal plate usually more or less indented or bilobed. Body often armed with capitate spines or tubercles.

Key to the Genera of the Callipterina.

1. Cauda distinctly knobbed, anal plate usually bilobed or sometimes deeply divided ..... 3.
   Cauda not distinctly knobbed, anal plate entire or almost so ..... 2.
2. Antennæ minutely setose, sensorium at base of unguis oval or somewhat rounded; oviparous female with secondary sensoria ..... Symydobius.
   Antennæ not minutely setose, sensorium at base of unguis long and narrow, oviparous female without secondary sensoria ..... Euceraphis.
3. Anal plate deeply divided with a U-shaped cleft so that the lobes appear as distinct; cauda knobbed ..... Therioaphis.
   Anal plate bilobed, not deeply divided; cauda very markedly knobbed ... 4.
4. Antennæ and often the cornicles with prominent hairs ..... Callipterus.
   Cornicles and antennæ without such hairs ..... 5.
5. Cornicles much reduced; wings sometimes horizontal in repose ..... Monellia.
   Cornicles truncate, fairly well developed; wings not horizontal in repose ... 6.

6. More or less distinct antennal tubercles present; oviparous female with secondary sensoria ..... Calaphis.
   No distinct antennal tubercles present; oviparous female without secondary sensoria ..... 7.
7. Anal plate slightly indented, sometimes almost entire; no apterous viviparous forms developed ..... Chromaphis.
   Anal plate distinctly bilobed; apterous viviparous forms common .... Myzocallis.

Genus CALAPHIS Walsh.

Plate IV, S, U.

1863. *Calaphis* Walsh, Proc. Ent. Soc. Phila., v. 1, p. 301.
1913. *Siphonocallis* Del Guercio, Redia, v. 9, p. 293.
1913. *Callipterinella* Van der Goot, Tijdschr. voor Ent., v. 56, p. 118.

Walsh erected his genus *Calaphis* for his *betulella*, a species which lacks the radial sector in the wing, and on this character he based his genus. Del Guercio based his Siphonocallis on *betulaecolens* Fitch, distinguishing it from his conception of the genus Callipterus, which conception, however, was not according to type. A study of *betulaecolens* shows that in all respects, with the exception of the radial sector, this species is similar to *betulella*. Many specimens of *betulaecolens* lack the radial sector and in most cases it is only faintly indicated at best. These two species, therefore, are probably congeneric.

The genus Callipterinella was based on *betularius* Kalt., and this species proves to be very similar to *betulaecolens*. It is true that the frontal tubercles are not prominent in this species as they are in the type of Calaphis. There seems no doubt, however, that all of these three species are closely related. This relation is shown in part by the sexual forms. The oviparous females all possess sensoria on the antennæ and are very similar in other body characters. This presence of sensoria in the oviparous form, while not important in some groups, separates quite distinctly this small group of species from those of the Myzocallis type. It seems evident that the relations of *betularius* are with *betulaecolens* and *betulella*. Callipterinella, therefore, is also a synonym.

Characters.—Cornicles present, distinct, truncate. Antennæ of six segments, armed with oval sensoria and placed on more or less distinct tubercles. Fore wings with the media twice branched, the radial sector either absent or faintly indicated, sometimes, however, complete; hind wings with both media and cubitus present. Cauda distinctly knobbed, anal plate bilobed, body with prominent hairs.

Forms living more or less solitary upon the foliage, sexes not markedly different from the other forms; oviparous female producing several eggs and possessing sensoria upon the antennæ.

Type (monotypical), *Calaphis betulella* Walsh.

Genus CALLIPTERUS Koch.

Plate IV, I, J.

1855. *Callipterus* Koch, Die Pflanzenläuse Aphiden, p. 208.
1870. *Callaphis* Walker, The Zoologist, v. 5, p. 2000.
1881. *Ptychodes* Buckton, Mon. British Aphids, v. 3, p. 39.
1904. *Panaphis* Kirkaldy, The Entomologist, v. 37, p. 279.
1917. *Nippocallis* Matsumura, Jour. Coll. Agr. Tohoku Univ., v. 7, pt. 6, p. 365.

In erecting the genus Callipterus, Koch included a number of species among which was *juglandis* Kalt. In 1860, Passerini set *juglandis* as the type of Callipterus and erected his Myzocallis for species similar to *coryli* Goetz.

Most writers overlooked Passerini's work and considered the genus Callipterus in the light of Myzocallis. This is the conception commonly held by many to-day. The application of Callipterus, however, must be restricted to species essentially like *juglandis*. All the other generic names listed as synonyms were, with one exception, used with this same species *juglandis* as type and therefore require little comment.

The genus Nippocallis was erected with *kuricola* Mats. as type. Specimens of this species studied by the writer are not in good condition for the observation of the anal plate. All the characters visible, however, indicate that this species is a Callipterus.

Characters.—Cornicles present, truncate in form, rather prominent and often armed with long hairs. Antennæ of six segments, armed with stout hairs, sensoria usually oval. Fore wings with the media twice branched, hind wings with both cubitus and media present. Veins usually bordered. Radial sector often faintly indicated. Cauda not distinctly knobbed in all cases. Anal plate bilobed; body usually covered with prominent hairs.

Forms living free upon the foliage. Sexual forms not differing markedly from the other forms, oviparous female producing several eggs.

Type (fixed by Passerini, 1860), *Aphis juglandis* Frisch.

Genus CHROMAPHIS Walker.

Plate IV, O, P.

1870. *Chromaphis* Walker, The Zoologist, v. 5, p. 2001.

The genus Chromaphis was erected with *juglandicola* Kalt. as type. It is related quite closely to Monellia.

Characters.—Cornicles moderate in size, somewhat flanged. Antennæ of seven segments armed with oval sensoria. Fore wings with the media twice branched, hind wings with media and cubitus present, wings not held horizontally in repose. Cauda knobbed, anal plate slightly indented. Sexual forms somewhat similar to the viviparous ones. Males usually winged. Oviparous female with the ovaries developed normally, laying numerous eggs.[1]

Forms living free upon the foliage usually all summer; viviparous generations winged.

Type (monotypical), *Aphis juglandicola* Kalt.

[1] Davidson believes as many as 30 may be produced by one female.

Genus THERIOAPHIS Walker.

Plate IV, K, L.

1870. *Therioaphis* Walker, The Zoologist, p. 1999.
1905. *Kallistaphis* Kirkaldy, Can. Ent., v. 37, p. 417.
1906. *Eucallipterus* Schouteden, Ann. Ent. Soc. Belg., v. 50, p. 31.[1]
1915. *Neocallipterus* Van der Goot, Beiträge zur Kennt. der Holl. Blattläuse, p. 320.

The genus Therioaphis Walker was erected with *ononidis* Kalt. as type, and *ononidis* has been shown by Theobald to be the common "yellow clover aphis," *trifolii* of Monell. This species has a deeply cleft anal plate quite different from that of Myzocallis. Eucallipterus was erected with *tiliae* L. as type, a species with quite similar structure. Eucallipterus, therefore, will become a synonym. *Betulicola* Kalt. has been used as type by Kirkaldy and Van der Goot. According to Das, Van der Goot considers this congeneric with *trifolii*. Therefore Therioaphis is the name that must be used.

Characters.—Cornicles truncate, rather constricted mesad of apex. Antennæ of six segments without prominent hairs and armed with subcircular sensoria. Fore wings with media twice branched; hind wings with both media and cubitus present. Wings often variously marked. Prothorax rather elongate; cauda knobbed. Anal plate deeply bifid so that two long, narrow lobes are formed. Body often with prominent hairs.

Type (monotypical), *Aphis ononidis* Kalt.

Genus EUCERAPHIS Walker.

Plate IV, Q, R.

1870. *Euceraphis* Walker, The Zoologist, p. 2001.
1908. *Callipteroides* Mordwilko, Ann. Mus. Zool. l'Acad. Imp. des Sci. St. Petersbourg, v. 13, p. 377.
1913. *Callipteroides* Van der Goot, Tijd. voor. Ent., v. 56, p. 151.

When Walker erected his genus Euceraphis with *betulae* L. as type he had in mind evidently the same species as that described by Koch under the same specific name, and thus separated species of this type. Mordwilko in 1900 erected the genus Callipteroides with *nigritarsus* Heyden as type. Specimens of this species received from Mordwilko show that the species he had was the *betulae* of Koch or at least a species very close to it. This would then make Callipteroides a synonym of Euceraphis. In 1913 Van der Goot used the name Callipteroides with *betulae* Koch as type and his placing, therefore, should be under Euceraphis.

Characters.—Cornicles present, truncate. Antennæ of six segments, long and slender, armed with rather narrow sensoria usually near the base of segment III, the unguis of segment VI usually not much longer than the base, sensorium at the base of unguis long, oval, and fringed; more or less distinct frontal tubercles present. Fore wings with the media twice branched, hind wings with both media and cubitus present. Cauda usually knobbed and rather large. Anal plate usually entire. Abdomen of the alate form often with distinct wax-producing glands. Forms very large and usually solitary in habit, sexes similar to the other forms; oviparous female producing several eggs.

Type (fixed by Walker, 1870), *Aphis betulae* (L.) Walker (=*Callipterus betulae* Koch).

[1] There is considerable evidence for keeping this genus distinct.

Genus MONELLIA Oestlund.

Plate IV, M, N.

1887. *Monellia* Oestlund, Geol. and Nat. Hist. Survey Minn., Bul. no. 4, p. 44.

The genus Monellia Oestlund was erected for *caryellus* Fitch and only one species was included in the genus at the time. Several other species, however, were made synonyms of *caryellus* which are quite different from that species and fall into other genera.

Characters.—Cornicles present as mere rings; antennæ slender, of six segments; sensoria oval or subcircular; head broad for its length; prothorax prominently separated from the mesothorax. Fore wings with the media twice branched; hind wings with both media and cubitus present. Wings often held flat upon the back, cauda knobbed, anal plate bilobed. Forms living solitary upon the leaves, sometimes having the power of leaping. Apterous forms rare. Sexes feeding; oviparous female laying several eggs.

Type (monotypical), *Aphis caryella* Fitch.

Genus MYZOCALLIS Pass.

Plate IV, G, H.

1860. *Myzocallis* Passerini, Gli Afidi, p. 28.
1860. *Pterocallis* Passerini, Gli Afidi, p. 28.
1894. *Subcallipterus* Mordwilko, Varshava Univ. Izviestiia, v. 8, no. 58, p. 53.
1894. *Tuberculatus* Mordwilko, Varshava Univ. Izviestiia, v. 8, no. 58, p. 60.
1913. *Callipterus* Van der Goot, Tijd. voor Ent., v. 56, p. 116.
1915. *Tuberculoides* Van der Goot, Beiträge zur Kennt. der Holl. Blattläuse, p. 313.
1917. *Acanthocallis* Matsumura, Jour. Coll. Agr. Tohoku Univ., v. 7, pt. 6, p. 368.
1917. *Takecallis* Matsumura, Jour. Coll. Agr. Tohoku Univ., v. 7, pt. 6, p. 373.

When Passerini erected the genus Myzocallis in 1860 he placed *coryli* Goetz as type. Later in the same work he erected his genus Pterocallis with *alni* Pass. as type. This species proves to be very similar indeed to *coryli*, so similar in most of the characters that the writer believes the genus Pterocallis to be a synonym of Myzocallis. The type of the genus, *coryli* Goetz, was also placed as the type of Callipterus by Van der Goot, in 1913, in spite of the fact that another type for that genus had been set in 1860. Callipterus Van der Goot (1913) is therefore a synonym of Myzocallis. The species *alni* Pass. is universally considered the same species as *alni* Fab., and this species was made the type of the genus Subcallipterus by Mordwilko in 1894. Subcallipterus Mordwilko, 1894, is therefore a synonym of Myzocallis for the same reason as is Pterocallis Pass., 1860. The species *querceus* Kalt. was made the type of the Tuberculatus by Mordwilko in 1894, but this species seems too closely related to *coryli*. Tuberculatus, therefore, becomes a synonym. The species *quercus* Kalt. was made the type of Tuberculoides by Van der Goot, 1915, and this is quite typically a Myzocallis. A number of genera have been erected by Matsumura which are so very little different from the type species that they are listed here as synonyms. This author follows the idea of proportions of the antennal segments as generic characters.

Characters.—Cornicles truncate without a very distinct neck; antennæ of six segments armed with a few minute bristles and oval or subcircular sensoria. Fore wings with the media twice branched; hind wings with both media and cubitus present. Cauda knobbed; anal plate bilobed, not divided; body usually with stout hairs.

Type (fixed by Passerini, 1860), *Aphis coryli* Goetz.

Genus SYMYDOBIUS Mordwilko.

Plate IV, DD, EE.

1884. *Symydobius* Mordwilko, Varshava Universitetskiia Izviestiia, v. 8, no. 55, p. 65.
1917. *Tetraneura* Matsumura, Jour. Coll. Agr. Tohoku Univ., v. 7, pt. 6, p. 366.
Symdobius of later authors.

The genus Symydobius Mord., which was erected for *oblongus* Heyden, has often been spelled Symdobius by subsequent writers. This is probably due to the erection of the genus in a Russian publication which is available to few workers, at least in this country. Specimens of this species studied were collected by Mordwilko at Petrograd and Warsaw and by Schouteden at Brussels. The species which passes under the name of *oblongus* in America is quite distinct, as has been pointed out by the writer.

Characters.—Cornicles present, truncate or with an evident neck and on a broad low base. Antennæ of six segments armed with numerous delicate hairs, sensoria somewhat oval or subcircular; sensorium at the base of the unguis not long and narrow, with a fringe but without a prominent one. cauda semicircular, anal plate similar in shape, sometimes slightly indented. Fore wings with the media twice forked; hind wings with both media and cubitus present, somewhat separated at the base.

Type (monotypical), *Aphis oblonga* Heyden.

Subtribe SALTUSAPHIDINA.

The subtribe Saltusaphidina is separated from the other related ones principally on the nature of the head. The most important character, possibly, is the structure of the eyes, in which the ocular tubercles appear to be wholly lacking.

Characters.—Forms living usually in damp places upon the foliage of sedges and grasses, narrow elongate bodies, eyes with ocular tubercles lacking, legs often modified for leaping. Oviparous forms apterous, somewhat similar to the viviparous forms, producing several eggs.

KEY TO THE GENERA OF THE SALTUSAPHIDINA.

Head considerably elongate, cornicles cup shaped, legs modified for leaping.....Saltusaphis.
Head not much elongated, cornicles mere rings, legs not modified for leaping.....Thripsaphis.

Genus THRIPSAPHIS Gillette.

Plate IV, X.

1917. *Thripsaphis* Gillette, Can. Ent., v. 49, p. 193.

The genus Thripsaphis was separated from Saltusaphis for *balli* Gillette, which the present writer had included in that genus, and certain other similar species.

Characters.—Cornicles present as slightly elevated rings; antennæ of six segments armed with subcircular sensoria. Eyes without ocular tubercles. Fore wings with the media twice branched, hind wings with the cubitus sometimes absent, cauda knobbed, anal plate divided, body with spinelike hairs.

Forms living free upon grasses and sedges in moist localities. Sexes apterous, oviparous female producing several eggs.

Type (fixed by Gillette, 1917), *Brachycolus balli* Gill.

Genus SALTUSAPHIS Theobald.

Plate IV, V, W.

1915. *Saltusaphis* Theobald, Bull. Ent. Research, v. 6, pt. 2, p. 138.

Characters.—Cornicles present, cup-shaped or truncate; antennæ of five segments, minutely setose; sensoria small and subcircular. Head elongate, ocular tubercles absent. Fore wings with the media twice branched; hind wings with the cubitus usually absent; cauda knobbed; anal plate divided, caudal extremity of the abdomen sometimes bilobed; body covered with spines which are often modified into different shapes.

Forms living more or less solitary upon the leaves of grasses or sedges in marshy regions. Sexual forms apterous, oviparous female laying several eggs.

Type (monotypical), *Saltusaphis scirpus* Theo.

Subtribe DREPANOSIPHINA.

The subtribe Drepanosiphina is evidently related to the callipterine branch of the tribe rather than the chaitophorine one. It has specialized in the opposite direction from the Monaphidina in that the cornicles are more or less prominently developed. It would appear to bear the same relation to this branch of the tribe as does the Pterocommina to the chaitophorine one. There is considerable variation in the development of the cornicles, even within certain of the genera. Some have very large cornicles, others have small ones. They all appear, however, to have the same general structure.

Characters.—Cornicles present, varying greatly in development from very small to very large. Cauda somewhat knobbed, anal plate slightly indented. Oviparous female with a long drawn out ovipositor.

Key to the Genera of the Drepanosiphina.

1. Cornicles extremely long and somewhat swollen in the middle.....Drepanosiphum.
   Cornicles not extremely long and larger at the base..... 2.
2. Cornicles very small, truncate.....Neosymydobius.
   Cornicles large with a swollen region at the base.....Drepanaphis.

Genus DREPANAPHIS Del Guercio.

Plate IV, JJ-LL.

1909. *Drepanaphis* Del Guercio, Rivista di Patologia Vegetale, n. s., v. 4, no. 4, p. 49-50.
1909. *Phymatosiphum* Davis, Annals Ent. Soc. America, v. 2, p. 196.

The two generic names given were both used with the same type species, and therefore no discussion in regard to the use of the names is necessary.

Characters.—Cornicles large but not of the same shape as those of Drepanosiphum, being rather narrow toward the distal extremity and swollen at the base. Antennæ of six segments armed with subcircular or oval sensoria and a few scattered hairs. Fore wings with the media twice branched, hind wings with both media and cubitus present. Cauda knobbed, anal plate somewhat indented. Forms living more or less

solitary upon the foliage of trees. Males winged. Oviparous female with a distinct elongated ovipositor and producing several eggs.

Type (monotypical), *Drepanosiphum acerifolii* Thos.

Genus DREPANOSIPHUM Koch.

Plate IV, MM.

1855. *Drepanosiphum* Koch, Die Pflanzenläuse Aphiden, p. 201.
1885. Type fixation, Lichtenstein, Monographie des Aphidiens, p. 175.

Cornicles very long, quite distinctly swollen in the middle or subcylindric. Antennæ of six segments with short, scattered hairs and oval or subcircular sensoria. Fore wings with the media twice branched. Hind wings with both media and cubitus present. Cauda knobbed, anal plate slightly indented.

Forms living upon the foliage of plants, males usually winged. Oviparous female with a distinct elongated ovipositor.

Type (fixed by Lichtenstein, 1885), *Aphis platanoides* Schr.

Genus NEOSYMYDOBIUS, n. gen.

The genus Neosymydobius is erected for species similar to that described as *Symydobius albasiphus* Davis. It is evident that this species is not a Symydobius. Members of that genus are very large and differ in several ways. We place the present genus here with considerable doubt.

Characters.—Cornicles small, truncate, Callipterus-like. Antennæ of six segments which are armed with a few rather stout hairs. Fore wings with the media twice branched, hind wings with both media and cubitus present. Cauda knobbed, anal plate slightly indented. Forms living in colonies upon the foliage of trees. Body, particularly of the apterous forms, covered with rather stout spine-like hairs. Oviparous female with a long ovipositor and depositing several eggs. Males usually winged.

Type, *Symydobius albasiphus* Davis.

Subtribe MONAPHIDINA.

The subtribe Monaphidina, erected for the genus Monaphis, is very similar in most respects to the Callipterina, but lacks the cornicle dorsally. It seems evident that it is a specialization from insects of the Callipterus type in much the same way that Fullawaya is related to those of the Chaitophorus type. One genus only is known at present. This differs more from the Callipterina than does Fullawaya from the Chaitophorina.

Genus MONAPHIS Walker.

1870. *Monaphis* Walker, The Zoologist, p. 2001.
1894. *Bradyaphis* Mordwilko, Varshava Universitetskiia Izvicstiia, v. 8, p. 59.

Few remarks on the synonymy of the genus Monaphis Walker are necessary as the same species was used as type in both cases mentioned. The genus is a very remarkable one, being peculiar in many ways.

Characters.—Cornicles faint; antennæ of six segments, without distinct hairs, sensoria small and circular; cauda somewhat rounded but with an acute point or projection; anal plate similar; fore wings with the media twice branched; hind wings with both media and cubitus present.

Type (fixed by Walker, 1870), *Aphis antennata* Kalt.

Subtribe CHAITOPHORINA.

The subtribe Chaitophorina is composed of aphids which are similar in many ways to the Callipterina. They differ in that they are always armed with long hairs which quite prominently cover the antennæ as well as the other parts of the body. Some of the species perhaps are given more to living in colonies than are the Callipterina, but this habit varies in that subtribe as well.

KEY TO THE GENERA OF THE CHAITOPHORINA.

1. Cauda quite distinctly knobbed ..... 2.
   Cauda not knobbed but rounded ..... 3.
2. Antennæ of five segments ..... Sipha.
   Antennæ of six segments ..... Chaitophorus.
3. Body elongate; small dimorphic forms developed ..... Periphyllus.
   Body not elongate; no dimorphic forms developed ..... 4.
4. Antennæ of five segments ..... Atheroides.
   Antennæ of six segments 5
5. Anal plate entire or slightly indented ..... Neothomasia.
   Anal plate divided into two quite separate parts ..... Patchia.

Genus ATHEROIDES Haliday.

1839. *Atheroides* Haliday, Ann. and Mag. Nat. Hist., v. 2, p. 189.

More careful collecting of marsh-inhabiting species may show that this genus is a specialization from the Chaitophorina as is the Saltusaphidina from the Callipterina, for most specimens falling here seem to lack ocular tubercles.

Characters.—Antennæ of five segments armed with stout spines. Fore wings with media twice branched; hind wings with both media and cubitus present. Cornicles reduced to mere rings. Cauda broadly rounded. Form elongate and flat. Entire insect prominently spined. Species living on sedges and grasses.

Type (set by Kirkaldy, 1906), *Atheroides serrulatus* Haliday.

Genus CHAITOPHORUS Koch.

Plate IV, CC.

1854. *Chaitophorus* Koch, Die Pflanzenläuse Aphiden, p. 1.
1870. *Tranaphis* Walker, The Zoologist, p. 1999.
1870. *Arctaphis* Walker, The Zoologist, p. 2000.
1912. *Eichochaitophorus* Essig, Pom. Coll. Journ. Ent., v. 4, p. 721.
1912. *Micrella* Essig, Pom. Coll. Journ. Ent., v. 4, p. 716.
1856. Type fixation, Gerstaecker, Bericht for 1854, p. 162.

In 1854 Koch erected the genus Chaitophorus with several species. *Aphis populi* was made the type by Gerstaecker in 1856. The same species was used by Walker as type of his genus Arctaphis and therefore this name will become a synonym. The types of both of Essig's genera show that these vary little from *populi*. The genus Tranaphis was erected with *salicivorus* Walker as type and this species is similar in general characters to *populi*. Therefore, Tranaphis will become a synonym.

In 1860 Passerini used *aceris* L. as the type of Chaitophorus and this placing has often been followed, but that of Gerstaecker has priority.

Characters.—Cornicles present, truncate, rather prominent. Antennæ of six segments, armed with subcircular sensoria and rather prominent hairs. Fore wings with the media normally twice branched, hind wings with both media and cubitus present. Cauda distinctly knobbed. Anal plate entire, sometimes somewhat indented. Sexual forms not differing markedly from the viviparous ones. Males winged, as a rule, but sometimes intermediate or apterous. Oviparous females apterous with the ovaries normally developed and producing several eggs. Both sexes feeding.

Forms living usually upon the leaves of trees; no dimorphic forms developed.

Type (fixed by Gerstaecker, 1856), *Aphis populi* L.

Genus PATCHIA, n. gen.

Characters.—Cornicles truncate: antennæ of six segments, hairy and with circular sensoria. Fore wings with the media twice branched, the radial sector absent or faintly indicated: hind wings with both media and cubitus present. Cauda rounded or slightly conical; anal plate divided into two separate parts.

Type, *Patchia virginiana* Baker.

Patchia virginiana, n. sp.

Alate viviparous female.—Antennæ as follows: III, 0.48 mm., with an even row of about 12 subcircular sensoria; IV, 0.288 mm.; V, 0.24 mm.; VI (0.16–0.192 mm.). Color brown with a large black patch on dorsum of abdomen and with lateral patches of same color. Wings with the radial sector absent and the veins heavily bordered. Apterous form almost solid velvety black. Both forms secreting wax.

Found on the bark of chestnut at East Falls Church, Va. The type is in the U. S. National Museum (Cat. No. 23063).

Genus PERIPHYLLUS Van der Hoeven.

Plate IV, AA, BB.

1852. *Phillophorus* Thornton, Proc. Ent. Soc. London, n. s., v. 2, p. 78.
1858. *Chelymorpha* Clark, The Microscope.
1863. *Periphyllus* Van der Hoeven, Tijd. voor. Ent., v. 6, p. 7.
1913. *Chaitophorinella* Van der Goot, Tijd. voor Ent., v. 56, p. 150.
1917. *Arakawana* Matsumura, Journ. Coll. Agr. Tohoku Univ., v. 7, pt. 6, p. 375.

In 1852 Thornton used the name Phillophorus with his *testudinatus* as type. This name had, however, been used in 1840. Koch erected the genus Chaitophorus in 1854 and included therein a number of species. In 1856 Gerstaecker set *Aphis populi* L. as the type of Chaitophorus and therefore prevented the use of the name for species such as *testudinatus* unless all of Koch's species are included. In 1858 Clark used the name Chelymorpha with the specific name *phyllophora*. The species he discussed is the *testudinatus* of Thornton. The generic name Chelymorpha, however, was used as early as 1834 and, therefore, is not available. In 1863 Van der Hoeven employed the generic term Periphyllus with his species *testudo* as type. This name is a synonym of *testudinatus* Thornton, and the generic name seems to be the first one available.

In 1913 Van der Goot employed the generic name Chaitophorinella with *testudinatus* as type, and this name, therefore, will become a synonym of Periphyllus.

Characters.—Cornicles present, truncate in form, often sculptured. Antennæ of six segments (with the exception of the dimorph) armed with oval sensoria and prominent hairs. Fore wings with the media twice branched; hind wings with both media and cubitus present. Cauda and anal plate rounded.

Forms living upon the foliage of trees. Sexes not strikingly different from the other forms, possessing beaks and feeding. Males winged, oviparous females with the ovaries normally developed, thus laying several eggs. Small lamellate or hairy dimorphic forms produced in summer.

Type (monotypical), *Periphyllus testudo* Van der Hoeven (=*testudinatus* Thornton).

Genus NEOTHOMASIA, n. n.

Plate IV, Y, Z.

1910. *Thomasia* Wilson, Can. Ent., v. 42, p. 386.

Wilson erected the genus Thomasia with *populicola* Thos. as type, and his description appeared in December, 1910. The same name had, however, been used for a genus of Diptera, the description of which appeared in September, 1910. A new name, Neothomasia, therefore, is necessary for Wilson's genus.

Characters.—Cornicles present; antennæ of six segments armed with subcircular sensoria and prominent hairs. Fore wings with the media twice branched, hind wings with both media and cubitus present. Cauda and anal plate both rounded.

Forms living in colonies upon the leaves or bark of trees; no dimorphic forms produced; sexual forms not markedly different from the viviparous ones. Oviparous females laying several eggs.

Type (monotypical), *Chaitophorus populicola* Thos.

Genus SIPHA Pass.

1860. *Sipha* Passerini, Gli Afidi, p. 29.

This genus and Atheroides are distinct from the other genera in the subtribe by possessing five-segmented antennæ instead of six-segmented ones. The genus has not been much confused excepting by Thomas's placing of *rubifolii*. For a time some workers in this country were led to conceive of the genus as indicated by that species which in reality belongs in the Aphidini.

Characters.—Cornicles present, truncate, short, almost mere rings. Antennæ of five segments armed with large circular sensoria. Body form flat, entire insect covered with rather long stout hairs. Fore wings with the media twice branched, hind wings with both media and cubitus present. Cauda knobbed, anal plate rounded. Forms living upon the leaves of grasses usually in moist localities, sometimes even submerged, the water appearing to affect them little.

Type (fixed by Passerini, 1860), *Aphis glyceriae* Kalt.

Subtribe PTEROCOMMINA.

The subtribe Pterocommina is composed of bark-feeding insects, some of which retain quite primitive characters. It is the writer's opinion, however, that they are, as a group, more specialized than the Chaitophorina, but closely related. This is indicated by the development of the cornicles met with in the species. Like the

Drepanosiphina, this development varies to a great extent in the different species.

Only two genera occur in the tribe. They may be separated as follows:

KEY TO THE GENERA OF THE PTEROCOMMINA.

Cornicles cylindrical ..... Pterocomma.
Cornicles somewhat swollen ..... Melanoxantherium.

Genus PTEROCOMMA Buckton.

Plate IV, PP.

1857. *Cladobius* Koch, Die Pflanzenläuse Aphiden, p. 251.
1860. *Aphioides* Passerini, Gli Afidi, p. 28.
1879. *Pterocomma* Buckton, Monog. Br. Aphides, v. 2, p. 142.
1905. *Aristaphis* Kirkaldy, Can. Ent., v. 37, p. 416.

In 1857 Koch erected the genus Cladobius with *populeus* Kalt. as type. This name, however, had been used previously. So Passerini in 1860 employed the name Aphioides. This name had also been used. Kirkaldy, therefore, gave the new name Aristaphis in 1905. In 1879, however, Buckton described the genus Pterocomma with a very similar species as type.

Characters.—Cornicles present, rather short and cylindrical. Antennæ of six segments armed with prominent hairs and subcircular sensoria. Fore wings with the media twice branched; hind wings with both media and cubitus present. Cauda and anal plate rounded.

Type (monotypical), *Pterocomma pilosa* Buckt.

Genus MELANOXANTHERIUM Schouteden.

Plate IV, NN, OO.

1879. *Melanoxanthus* Buckton, Monog. Br. Aphides, v. 2, p. 21.
1901. *Melanoxantherium* Schouteden, Ann. Ent. Soc. Belg., v. 45, p. 113.

In 1879 Buckton described the genus Melanoxanthus with *salicis* L. as type, but, as this name was preoccupied, Schouteden suggested the name Melanoxantherium.

Characters.—Cornicles present, variable in size, but usually more or less swollen. Antennæ of six segments armed thickly with hairs and possessing oval or subcircular sensoria. Fore wings with the media twice branched, hind wings with both media and cubitus present. Cauda and anal plate rounded.

Forms living in colonies usually on the bark of trees, males usually winged. Oviparous females laying several eggs.

Type (monotypical), *Aphis salicis* L.[1]

Subtribe FULLAWAYINA.

The subtribe Fullawayina is related somewhat closely to the Chaitophorina from which it is a specialization, as is evidenced by the reduction and total lack of the cornicles. It is very suggestive of Monaphis, but evidently arose from quite a different line of development, following Chaitophorus rather than the Callipterus group. Only one genus is represented.

[1] The writer is forced to change his view that *Ptercomma pilosa* is closely related to *populifoliae* Fitch. This was based on Pergande's published statement of his examination of the type. Later notes on the type indicated that it resembles *populea*.

Genus FULLAWAYA Essig.

1912. *Fullawaya* Essig, Pomona Coll. Journ. Ent., v. 4, p. 716.

The genus Fullawaya seems to bear somewhat the same relation to Chaitophorus that Monaphis does to Myzocallis. Were it not for the hairy condition of the antennæ and the character of the cauda and anal plate, Fullawaya might be placed as a synonym of Monaphis, but it is evidently unrelated.

Characters.—Cornicles absent; antennæ of six segments, armed with rather long bristle-like hairs, sensoria small and circular, cauda rounded and armed with long curved hairs. Fore wings with the media twice branched, hind wings with both media and cubitus present.

Forms living upon the roots of plants.

Type (monotypical), *Fullawaya saliciradicis* Essig.

Tribe GREENIDEINI.

The tribe Greenideini was first separated by Wilson under the name Trichosiphina. The insects falling here show a most remarkable development of the cornicles. These are sometimes as long as the entire body in the alate forms. In the apterous individuals they are usually swollen. In both they are very thickly covered with long hairs, a condition not met with in any of the other Aphidinae with long cornicles. It is true that some species of Macrosiphum and occasionally species of the other genera show here and there minute hairs on the cornicles, but they do not approach in any way members of this tribe in cornicle armature. The development of the cauda in this group is also remarkable.

Characters.—Cornicles present and remarkably developed into cylindrical or slightly swollen tubes often as long as the body and thickly covered with long hairs. Antennæ of five or six segments armed with oval or subcircular sensoria. Males winged. Forms living free upon the foliage.

Key to Genera of Greenideini.

1. Antennæ of five segments.....Eutrichosiphum.
   Antennæ of six segments..... 2.
2. Fore wings with the media twice branched, hind wings with both media and cubitus present.....Greenidea.
   Fore wings with media once branched, hind wings with neither media nor cubitus present.....Greenideoida.

Genus GREENIDEA Schouteden.

Plate V, F–K.

1905. *Greenidea* Schouteden, Spol. Zeylan, v. 2, p. 181.
1906. *Trichosiphum* Pergande, Ent. News, v. 17, p. 206.

In 1905, Schouteden erected a genus for the *Siphonophora artocarpi* of Westwood and redescribed the species, giving details lacking in Westwood's paper. Pergande erected his genus Trichosiphum, making his *anonae* the type. The characters Pergande used to separate his genus were in reality those of Greenidea.

Characters.—Cornicles extremely long and hairy; antennæ of six segments armed with oval or subcircular sensoria and distinct hairs. Fore wings with media twice branched; hind wings with both media and cubitus present. Sexes winged.

Type (monotypical), *Siphonophora artocarpi* Westw.

Genus GREENIDEOIDA Van der Goot.

Plate V, L–P.

1900. *Greenidea* Wilson, not Schouteden, Ann. Ent. Soc. Amer., v. 3, p. 317.
1916. *Greenideoida* Van der Goot, Zur Kenntniss der Blattläuse Java's, p. 140.

In discussing the genera of the Trichosiphini in 1910, Wilson based his descriptions and key on specimens in the collection of the Bureau of Entomology. Material in that collection determined as *artocarpi* by Pergande proves not to be that species for it does not agree with the descriptions given either by Westwood or Schouteden. Wilson, therefore, used the two generic terms Trichosiphum and Greenidea. In reality the species listed as *artocarpi* was undescribed at that time and the species of Trichosiphum presented all of the characters of Greenidea. Since that time Van der Goot has erected the genus Greenideoida for such species as that understood by Wilson to be *artocarpi*.

Characters.—Cornicles present, very long, subcylindrical, and armed with long hairs. Antennæ of six segments armed with oval or subcircular sensoria. Fore wings with the media once branched; hind wings reduced in size and lacking both the media and cubitus. Cauda and anal plate rounded.

Type (fixed by Van der Goot, 1916), *Greenideoida elongata* V. d. Goot.

Genus EUTRICHOSIPHUM Essig & Kuwana.

Plate V, A–E.

1918. *Eutrichosiphum* Essig & Kuwana, Proc. Cal. Acad. Sci., v. 8, no. 3, p. 97.

The genus Eutrichosiphum Essig and Kuwana was erected for the species *pasaniae* Okj.

Characters.—Similar in general characters to Greenidea. Antennæ of five segments, armed with long hairs and somewhat oval sensoria. Cornicles very long, subcylindrical and covered with hairs. Fore wings with the media twice branched, hind wings with both media and cubitus present. Cauda and anal plate rounded.

Type (monotypical), *Trichosiphum pasaniae* Okj.

Tribe SETAPHIDINI.

The correct position of the tribe Setaphidini is somewhat difficult to ascertain. In some ways it closely resembles the Aphidini, and in others suggests the Lachnini.

It has Aphis-like antennæ with, however, a reduced number of segments. The venation of the wings is also reduced. On the other hand it possesses cornicles situated on low flat cones somewhat like those of the Anoecina or Lachnina. But these cones are devoid of hairs.

It would appear that this tribe separated from the aphid line after the cornicles had lost their armature and before their development as indicated in the Aphidina and Macrosiphina began. These organs then remained somewhat primitive whereas reduction took place in the antennæ and wings. One genus only is represented.

Genus SETAPHIS Van der Goot.

Plate V, Q–X.

1916. *Setaphis* Van der Goot, Zur Kenntniss der Blattläuse Java's, p. 153.

Characters.—Cornicles present as rings, situated on low broad cones. Antennæ of five segments armed with small circular sensoria. Fore wings with the media once branched, hind wings reduced. Cauda and anal plate rounded. Body with two prominent caudal fingerlike projections.

Type (fixed by Van der Goot, 1916), *Setaphis luteus* V. d. Goot.

Tribe APHIDINI.

The tribe Aphidini is by far the largest tribe of the living Aphididae. Many of the most common species in the family as well as many of the most injurious ones belong here, and it is these forms which correspond to the popular conception of the family.

Besides being abundant they are varied, and a large number of genera is therefore found in this tribe. Specialization has taken place in a number of directions, but particularly in the development of cornicles, cauda, etc. The wings have become somewhat reduced in certain genera, but as a rule little reduction in these organs has occurred, the venation in most cases being as complete as in even the most primitive forms of the family. The antennæ have developed an elongate filamentous process to the distal segment, which in the Lachnini is represented by a very short thumblike projection. Wax secretion is found scarcely at all apart from that produced and secreted by the cornicles. The head shows certain peculiar developments in some of the tribes in that the antennæ are situated on prominent tubercles variously shaped and armed.

As a rule the body is more or less naked, being covered only by a few scattered hairs. In the peculiar specialized Cervaphidina, however, large toothed processes extend outward from the body surface.

Migration between a primary host and one or more secondary hosts often occurs. Apterous and alate viviparous forms, therefore, are common, but no definite relation exists between them. The forms feed mostly upon the leaves of trees and herbs but they may also be found feeding upon the twigs and roots. They are not infrequently attended by ants. The oviparous females are nearly always apterous, but the males, on the other hand, usually are winged. Apterous males, however, are common and intermediate forms between alate males and apterous males sometimes occur. Inter-

mediates between apterous and alate viviparous forms are of quite common occurrence and indicate possible origin of the apterous forms. It is no doubt true, however, that in members of this tribe the equilibrium is disturbed more easily than in some of the others, and that external influences have a more sudden and noticeable effect.

We have divided the tribe into four subtribes which may be separated as follows:

KEY TO THE SUBTRIBES OF THE APHIDINI.

1.	Body covered with long projections	CERVAPHIDINA.
	Body naked with the exception of a few hairs	2.
2.	Head without prominent antennal tubercles	APHIDINA.
	Head with prominent antennal tubercles	3.
3.	Wings with the radial sector normal	MACROSIPHINA.
	Wings with the radial sector more or less united with the upper branch of the media or hind wings reduced	PENTALONINA.

Subtribe APHIDINA.

The insects in the Aphidina show a great variation in regard to the cornicles and cauda. Some have very markedly developed cornicles, others have extremely small ones, while one genus lacks them altogether. The cauda varies from very large in genera like Hyalopterus to scarcely any visible cauda in some of the other genera. Certain of the genera appear more similar than others, for example, Hyalopterus, Pergandeidia, and Brachycolus all have small cornicles and somewhat large caudæ. Certain other genera, while appearing quite different in some ways, are evidently related. Cavariella, Hyadaphis, Aspidaphis, and Vesiculaphis all have characters which are very suggestive, although there are differences between them. So also there is a group suggesting Aphis. The various genera may be separated as follows:

KEY TO THE GENERA OF THE APHIDINA.

1.	Cornicles absent	Asiphonaphis.
	Cornicles present	2.
2.	Cornicles swollen, not subcylindrical or tapering	3.
	Cornicles subcylindrical or tapering but sometimes extremely short and ringlike	12.
3.	Fore wings with the media once branched; apterous form with very much swollen cornicles	Vesiculaphis.
	Fore wings with the media twice branched	4.
4.	Hind wings with the cubitus lacking	Carolinaia.
	Hind wings with both media and cubitus present	5.
5.	Abdomen with a dorsal projection or tubercle above cauda	6.
	Abdomen without this structure	7.

6. Tubercle very large, entirely covering posterior part of body; cornicles small, opening at the side..... Aspidaphis.
Tubercle of moderate size, as large as cauda in the apterous form; cornicles normal, opening at the end..... Cavariella.
7. Cornicles long, very abruptly and distinctly swollen.....Liosomaphis.
Cornicles of varying lengths, gradually swollen..... 8.
8. Cauda short and abruptly conical; cornicles about the same length as cauda and swollen in the middle.....Brevicoryne.
Cauda not strikingly short or abruptly conical..... 9.
9. Cornicles as short as the width of cauda at base or shorter..... 10.
Cornicles as long as or longer than the cauda..... 11.
10. Cornicles minute, tubercle-like.....Brachycolus.
Cornicles considerably longer than their diameter; cauda, particularly in the apterous form, large and long.....Hyalopterus.
11. Cauda in the apterous form long and broad, as long as the cornicles..Hyadaphis.
Cauda shorter than the cornicles, not correspondingly long and broad.....Rhopalosiphum.
12. Tarsi atrophied..... 13.
Tarsi normal..... 14.
13. Antennæ of six segments; cornicles rather short.....Atarsos.
Antennæ of five segments; cornicles very long and slender.....Mastopoda.
14. Cauda apparently absent, or a mere rounded platelike structure..... 21.
Cauda normal in appearance but often very short..... 15.
15. Fore wings with media once branched..... 22.
Fore wings with media twice branched..... 16.
16. Antennæ of five segments..... 24.
Antennæ of six segments..... 17.
17. Cornicles small, as short as width of cauda at base, which is without constriction..... 18.
Cornicles usually as long as or longer than cauda, Aphis-like..... 19.
18. Cauda very long and large in the apterous form .....Pergandeidia.
Cauda extremely short and subconical.....Microsiphum.
19. Cauda short and abruptly conical.....Anuraphis.
Cauda elongate and constricted near base..... 20.
20. Hind wings with media and cubitus present.....Aphis.
Hind wings with only one oblique vein.....Hysteroneura.
21. Cornicles minute, not as long as wide.....Cryptosiphum.
Cornicles moderate in length.....Acaudus.
22. Antennæ of six segments.....Toxoptera.
Antennæ of five segments..... 23.
23. Apterous form with a prominent median projection on the vertex and with four-segmented antennæ; cornicles minute.....Sanbornia.
Apterous form normal.....Yamataphis.
24. Cornicles elongate, Aphis-like .....Cerosipha.
Cornicles extremely short, body of apterous form, much arched.Siphonatrophia.

Genus ACAUDUS V. d. Goot.

Plate VI, A, B.

1913. *Acaudus* Van der Goot, Tijd. voor Ent., v. 56, p. 97.
1917. *Macchiatiella* Del Guercio, Redia, v. 12, p. 210.
1917. *Hannabura* Matsumura, Journ. Coll. Agr. Tohoku Univ., v. 7, pt. 6, p. 377.

Van der Goot erected his genus Acaudus with *lychnidis* L. as type. This species is quite similar to an Aphis without a cauda or with a very short, somewhat rounded cauda. The cornicles are not long.

Del Guercio's genus had his *trifolii* placed as type. The cornicles of this species appear to be a little longer than those of the type of Van der Goot's genus, but in other respects the insects seem to be quite similar. We feel that they belong to the same genus. We are keeping this genus distinct from Cryptosiphum, not only because of the minute cornicles in that genus but also on account of the peculiar head structure which is there seen. It is not typically Aphis-like.

Characters.—Head without prominent antennal tubercles. Antennæ of six segments. Fore wings with the media twice branched; hind wings with both media and cubitus present. Cornicles cylindrical, of moderate length; cauda reduced to a broad, short, rounded structure.

Type (fixed by Van der Goot, 1913), *Aphis lychnidis* L.

Genus ANURAPHIS Del Guercio.

Plate VI, C–F.

1907. *Anuraphis* Del Guercio, Redia, v. 4, p. 190.
1913. *Brachycaudus* Van der Goot, Tijd. voor Ent., v. 56, p. 97.
1913. *Dentatus* Van der Goot, Tijd. voor Ent., v. 56, p. 98.
1913. *Semiaphis* Van der Goot, Tijd. voor Ent., v. 56, p. 105.
1917. *Yezabura* Matsumura, Journ. Coll. Agr. Tohoku Univ., v. 7, pt. 6, p. 392.
1918. *Sappaphis* Matsumura, Trans. Sapporo Nat. Hist. Soc., v. 7, pt. 1, p. 18.

In 1907 Del Guercio erected the genus Anuraphis in which were included *pyri* Koch, *lappae* Koch, *iridis* Del Guercio, *ranunculi* Kalt., *myosotidis* Koch, *centaureae* Koch, *prunicola* Kalt., *tragopogonis* Kalt., *iani* Feer, *farfarae* Koch, and *persicae* Boyer.

These species, with the exception of *lappae* and *tragopogonis* which seem to belong to Aphis, have a broadly and somewhat abruptly conical cauda quite unlike that of the genus Aphis. In 1913, Van der Goot erected his genus Brachycaudus with one of these species, *myosotidis*, as type without referring any of the species to Anuraphis at all. It is evident that Brachycaudus is a synonym of Anuraphis. At the same time he erected the genus Semiaphis with *carotae* Koch as type. A study of this species, as seen in Plate VI, makes it evident that this is a species of the same general type. Semiaphis thus becomes a synonym of Anuraphis. Based on the minute tubercles, particularly on the head and caudal portion of the abdomen, Van der Goot also erected the genus Dentatus with *sorbi* Kalt. as type. Apart from these tubercles *sorbi* is in the character of the cauda, etc., a typical Anuraphis. In our American rosy aphis, a species very similar to *sorbi*, these tubercles are absent in many individuals, and in the fall migrants the caudal ones are nearly always absent. If this character were retained, therefore, the species would belong in one genus as far as the spring migrant is concerned, and in another genus when the fall migrant is considered. Dentatus, therefore, becomes also a synonym of Anuraphis.

Characters.—Head without prominent antennal tubercles. Antennæ of six segments and armed with subcircular sensoria. Fore wings with the media twice branched, hind wings with both media and cubitus present. Cornicles cylindrical, often short, though sometimes moderately long; cauda short, broad, and abruptly conical, never elongate and constricted as in Aphis. Males usually winged. Oviparous forms apterous.

Type (fixed by Del Guercio, 1907), *Aphis pyri* Koch.

Genus APHIS L.

Plate VI, G–I.

1758. *Aphis* Linnaeus, Systema Naturae, 10th ed., p. 451.
1817. *Loxerates* Rafinesque, Am. Mo. Mag. & Crit. Review, v. 1, p. 361.
1907. *Uraphis* Del Guercio, Redia, v. 4, p. 192.
1907. *Microsiphon* Del Guercio, Redia, v. 4, p. 192.
1913. *Myzaphis* Van der Goot, Tijd. voor Ent., v. 56, p. 96.
1913. *Stenaphis* Del Guercio, Redia, v. 9, p. 185.
1916. *Longiunguis* Van der Goot, Zur Kenntniss der Blattläuse Java's, p. 112.
1916. *Melanaphis* Van der Goot, Zur Kenntniss der Blattläuse Java's, p. 61.
1917. *Aburu* Matsumura, Jour. Coll. Agr. Tohoku Univ., v. 7, pt. 6, p. 407.
1917. *Arimakia* Matsumura, Jour. Coll. Agr. Tohoku Univ., v. 7, pt. 6, p. 405.

A number of species were included in the original genus by Linnaeus. Of these Lamarck set *Aphis ulmi* L. as type in 1801, and in 1802 Latreille set *Aphis sambuci* L. as type. *Aphis ulmi* L. is, according to Passerini, *Eriosoma lanuginosa* Hartig and the species now placed in Tetraneura. *Sambuci* is retained here as type and a request will be submitted that this species be fixed definitely by the International Commission. It would greatly disarrange the economic literature to change the meaning of this common name.

In 1907 Del Guercio erected two genera, Uraphis and Microsiphon based on the relative length of the cornicles and cauda. When considering certain individual species this would appear as a very fair character for use. But when large series of species are studied it will be found that in the species having the cauda of the typical Aphis shape there are all gradations of cornicles from the very short to the very long. This will be seen also in the forms having the abruptly conical cauda. Some species have very short cornicles and some quite long ones. Moreover, in the same species the cornicles in the different forms will bear a different relation to the length of the cauda. Species, therefore, having cornicles and cauda of essentially the same character should not be used as types of different genera depending on the length of the cornicles. If this were the case, certain species which are close to the border line of separation would on some individuals fall in one genus and on other individuals fall in a different genus. Under this rule, *sacchari* Zehnt. would, it is believed, belong to the genus Aphis, and Longiunguis, therefore, be a synonym of Aphis. Likewise the genus Melanaphis would be a synonym of Aphis. This genus was erected with *bambusae* Kirk. as type. The cornicles are short but the cauda is aphis-like. Where the generic characters are considered, the genus appears a synonym.

The genus Myzoaphis was erected by Van der Goot with *Aphis rosarum* Kalt. and *Aphis abietina* Walker. These two species show practically no antennal tubercles and are very little different from a typical Aphis, excepting in the clothing of the antennæ and body. The cauda as figured by Van der Goot is quite conical, but the writer's specimens are somewhat different from this and specimens of *abietinus* do not show a cauda exactly like his figure. In fact, they appear more like an Aphis. This genus, therefore, should not be separated or it will necessitate the separation of very many other forms under new names.

Characters.—Head without prominent antennal tubercles. Antennæ of six segments and armed with subcircular sensoria. Fore wings with the media twice branched; hind wings with both media and cubitus present. Cornicles cylindrical or slightly tapering. Cauda usually not as long as the cornicles, subconical, rather elongate, constricted about the middle. Anal plate rounded. Males usually winged, oviparous females apterous.

Type (by suspension of rules), *Aphis sambuci* L.

Genus ASPIDAPHIS Gillette.

Plate VI, L–O.

1917. *Aspidaphis* Gillette, Can. Ent., v. 49, p. 196.

The genus Aspidaphis appears to be related both to Cavariella and to Vesiculaphis. It has the short, blocky form of Vesiculaphis and also the peculiar integument. On the other hand, certain species with a similar integument are met with in Cavariella. The development of the dorsal abdominal tubercle is here very pronounced and the cornicles have taken on a peculiar shape.

Characters.—Head without prominent antennal tubercles; antennæ short, of five segments, armed with subcircular sensoria. Wing venation normal. Cornicles very small, somewhat swollen near the distal extremity and with the opening in the side of the cornicle, not at the tip. Abdomen with a dorsal caudal tubercle developed into a large conical process extending beyond and fully covering the cauda in the apterous form. Body elongate.

Type (monotypical), *Aspidaphis polygonii* Gill.

Genus ASIPHONAPHIS Wilson & Davis.

1919. *Asiphonaphis* Wilson & Davis, Ent. News, v. 30, p. 39.

Characters.—Head without prominent antennal tubercles. Antennæ of six segments armed with subcircular sensoria. Fore wings with the media twice branched; hind wings with both media and cubitus present. Cornicles absent entirely. Abdomen with large lateral tubercles. Cauda somewhat conical or Aphis-like. Anal plate rounded.

Type (monotypical), *Asiphonaphis pruni* Wilson & Davis.

Genus ATARSOS Gillette.

Plate VI, P–S.

1911. *Atarsos* Gillette, Ent. News, v. 22, p. 440.

Characters.—Head without prominent antennal tubercles. Antennæ of six segments armed with subcircular, somewhat tuberculate sensoria; fore wings with the media twice branched, hind wings with both media and cubitus present. Cornicles rather

short, subcylindrical; cauda somewhat conical, not quite as long as the cornicles; anal plate rounded. Tarsi atrophied in all the forms.

Type (monotypical), *Atarsos grindeliae* Gill.

Genus BRACHYCOLUS Buckton.

Plate VI, T, U.

1879. *Brachycolus* Buckton, Mon. British Aphides, v. 2, p. 146.
1913. *Brachysiphum* Van der Goot, Tijd. voor Ent., v. 56, p. 105.

The genus Brachycolus was erected with *stellariae* Hardy as type and is easily recognized from the structure of the cornicles. Van der Goot's genus is in all essential respects the same, the type of that genus being *thalictri* Koch.

Characters.—Head without prominent antennal tubercles. Antennæ of six segments and armed with subcircular sensoria. Wing venation normal. Cornicles very small, especially in the apterous form. Cauda medium in size and conical. Body elongate; legs and antennæ usually short.

Type (monotypical), *Aphis stellariae* Hardy.

Genus BREVICORYNE V. d. Goot.

Plate VI, J, K.

1915. *Brevicoryne* Van der Goot, Beiträge z. Kennt. d. Holl. Blattläuse, p. 245.
1916. *Oedisiphum* Van der Goot, Zur Kenntniss der Blattläuse Java's, p. 122.
1918. *Brevicoryne* Das, Mem. Ind. Mus., v. 6, p. 179.

The genus Brevicoryne was erected with *Aphis brassicae* L. as type, a species in which the cornicles are very short and somewhat swollen in the middle, and the cauda conical. In the species *Oedisiphum compositarum* V. d. Goot quite similar characters are found. The cornicles appear to be somewhat more slender but in the main the species appear alike. Oedisiphum, therefore, becomes a synonym.

Characters.—Head without prominent antennal tubercles; antennæ of six segments and armed with subcircular sensoria. Wing venation normal. Cornicles short, not much longer than the cauda and swollen in the middle. Cauda short and broadly conical.

Forms not especially elongate.

Type (monotypical), *Aphis brassicae* L.

Genus CAROLINAIA Wilson.

Plate VI, V, W.

1911. *Carolinaia* Wilson, Can. Ent., v. 43, p. 61.

The genus Carolinaia Wilson is related very closely to Rhopalosiphum. In fact some of the species placed here are distinguished from members of that genus only by the fact that the cubitus is lacking in the hind wing. It is true that the type species was described as having five-segmented antennæ in the apterous form. But other species, like this in all other respects, have normal six-segmented antennæ. Certain species of Rhopalosiphum will show strains in which nearly all of the individuals will have five-segmented antennæ and yet the normal antenna for such species is a six-segmented one. In this closely related genus, therefore, it is not surprising if a similar condition is met with.

Characters.—Head without prominent antennal tubercles. Antennæ of five or six segments armed with subcircular sensoria. Venation of the fore wings normal; hind wings with the cubitus absent; cornicles elongate, slightly swollen near the distal extremity, but without a prominent neck near the proximal end. Cauda rather broadly conical.

Type (monotypical), *Carolinaia caricis* Wlsn.

Genus CAVARIELLA Del Guercio.

Plate VI, X–Z.

1911. *Cavariella* Del Guercio, Redia, v. 7, p. 326.
1914. *Corynosiphon* Mordwilko, Faune de la Russie Insecta, Aphidodea, p. 73.
1917. *Nipposiphum* Matsumura, Journ. Coll. Agr. Tohoku Univ., v. 7, pt. 6, p. 410.

Two new genera were erected in recent years: One by Del Guercio, Cavariella, with *pastinacae* L. as type; the other by Mordwilko, called Corynosiphon, but with no species definitely given. In a footnote, however, Mordwilko refers *capreae* Fab. to his Corynosiphon. Both of these genera, therefore, were used for insects of the same general type. This may be said too of Nipposiphum.

Characters.—Head without distinct antennal tubercles; antennæ of six segments, armed with prominent sensoria. Wing venation normal. Cornicles somewhat swollen near the distal end; cauda rather elongate, somewhat conical; abdomen with a tubercle or horn above the cauda, this tubercle or horn most prominent in the apterous form. Males winged; oviparous females usually apterous.

Type, *Aphis pastinacae* L.[1]

Genus CEROSIPHA Del Guercio.

1900. *Cerosipha* Del Guercio, Nuove Rel. Star. Firenze, ser. 1, no. 2, p. 116.
1918. *Metaphis* Matsumura, Trans. Sapporo Nat. Hist. Soc., v. 7, pt. 1, p. 1.

The genus Cerosipha Del Guercio was erected for a species, *passeriniana* Del Guercio, somewhat similar to Aphis but with five segments to the antennæ. The writer has been unable to study the type species and has based his remarks on *rubifolii* Thomas, an American species.

Characters.—Head without prominent antennal tubercles; antennæ of five segments. Aphis-like, armed with subcircular sensoria. Fore wings with the media twice branched, hind wings with both media and cubitus present. Cornicles cylindrical or somewhat tapering, cauda Aphis-like, somewhat tapering.

Type (monotypical), *Cerosipha passeriniana* Del G.

Genus CRYPTOSIPHUM Buckton.

Plate VI, PP, QQ.

1879. *Cryptosiphum* Buckton, Mon. Br. Aphides, v. 2, p. 144.

The genus Cryptosiphum Buckton can be distinguished from others having very short cornicles by the cauda which is here short and rounded, while in most other cases it is very long.

Characters.—Head without distinct antennal tubercles. Antennæ of six segments, rather short, and with subcircular sensoria. Fore wings with the media either once or twice branched. Hind wings with both media and cubitus present. Cornicles sub-

[1] The writer has a record to the effect that in a published paper Del Guercio used *pastinacae* as type of Cavariella, but he has been unable to locate the publication and can not reach Doctor Del Guercio through the mails.

cylindrical but extremely short, not as long as wide. Cauda very short and rounded, not Aphis-like; anal plate rounded.

Type (monotypical), *Cryptosiphum artemisiae* Buckt.

Genus HYSTERONEURA Davis.

1919. *Heteroneura* Davis, Can. Ent., v. 51, p. 228.
1919. *Hysteroneura* Davis, Can. Ent., v. 51, p. 263.

Characters.—Head without prominent antennal tubercles. Antennæ of six segments armed with subcircular sensoria. Fore wings with the media twice branched. Hind wings with the cubitus absent. Cornicles somewhat tapering or subcylindric, cauda Aphis-like; anal plate rounded.

Type (monotypical), *Aphis setariae* Thos.

Genus HYADAPHIS Kirk.

Plate VI, AA, BB.

1904. *Hyadaphis* Kirkaldy, The Entomologist, v. 37, p. 279.
1863. *Siphocoryne* Passerini, Aphididæ Italicæ, p. 8 (not Siphocoryne, 1860).

As indicated under the discussion of Siphocoryne, Passerini set *xylostei* as type of his genus in 1863. *Nymphaeae* had, however, been set in 1860, so Kirkaldy gave Hyadaphis to Passerini's 1863 conception, of which genus *xylostei* becomes the type. *Xylostei* has no caudal horn and is quite similar in general appearance to a Rhopalosiphum. We may separate the two genera, however, on the cauda, which in *xylostei*, particularly in the apterous form, is very large, fully as long as the cornicles, and broad, quite unlike that of *nymphaeae*. Several other species which have generally been considered in the same genus with *xylostei* possess a distinct caudal projection on the abdomen. One of these has been made the type of Cavariella so that such species will be removed from our conception of Hyadaphis.

Characters.—Head without prominent antennal tubercles; antennæ of six segments which are rather abundantly armed with tuberculate sensoria. Wing venation normal. Cornicles somewhat swollen but not prominently so. Cauda, particularly in the apterous form, large, as long as the cornicles, and broad. Males usually winged; oviparous females apterous; summer forms usually feeding on the Umbelliferæ.

Type (fixed by Kirkaldy, 1904), *Aphis xylostei* Schrk.

Genus HYALOPTERUS Koch.

Plate VI, RR–WW.

1854. *Hyalopterus* Koch, Die Pflanz. Aphiden, p. 76.
1917. *Hayhurstia* Del Guercio, Redia, v. 12, p. 208.

Aphis pruni Fab. was set as the type of this genus in 1860 by Passerini. In 1917 Del Guercio erected the genus Hayhurstia. There is little difference between the two as will be seen by examining the drawings given herewith. The cauda in Hayhurstia is slightly narrower than that in Hyalopterus. It is the writer's opinion that the two represent only one genus.

Two other genera may be mentioned here. They are Brachycolus Buckt. and Pergandeidia Schout. Specimens of the type species of Brachycolus show that this genus is quite similar to Hyalopterus, but it differs in the cornicles. In Brachycolus the cornicles are very small, almost mere rounded swellings in the apterous form, whereas

in Hyalopterus the cornicles are in the apterous form of fair size and not distinctly swollen.

Specimens of the type of Pergandeidia received from Schouteden show that this genus is very close to Hyalopterus and is probably almost too close for a very distinct genus. The diagnosis given by Wilson (1910) for this genus does not agree with the type species as determined by the author of the genus.

In the specimens examined by the writer the cauda, as will be seen in the drawings, is very much longer than the cornicles, bearing about the same ratio as seen in Hyalopterus.

Characters.—Head without distinct antennal tubercles, antennæ of six segments armed with subcircular sensoria. Wing venation normal. Cornicles very short, not much longer than the cauda is wide at its base, swollen beyond the middle, particularly in the alate form. Cauda long and broad, considerably longer than the cornicles. Form of the insects elongate, often more or less flat.

Type (fixed by Passerini, 1860), *Aphis pruni* Fab. (=*A. arundinis* Fab.).

Genus LIOSOMAPHIS Walker.

Plate VI, NN, OO.

1868. *Liosomaphis* Walker, The Zoologist, p. 1119.

The genus Liosomaphis Walker is related somewhat closely to Rhopalosiphum. The two genera, however, can be separated on the structure of the cornicles.

In Liosomaphis the cornicles have a very distinct neck near the proximal extremity, due to a constriction behind the prominent swelling. This is strikingly evident in the apterous form, as well as in the alate one. In Rhopalosiphum, on the other hand, there is no abrupt swelling, but only a gradual one which is not at all prominent, as in Liosomaphis.

Characters.—Head without prominent antennal tubercles. Antennæ of six segments armed with subcircular sensoria. Wing venation normal. Cornicles elongate, distinctly swollen in the middle, and with a constricted neck near the base. Structure in both the apterous and alate forms similar. Cauda not as long as the cornicles, somewhat narrowly conical. Males usually winged; oviparous females usually apterous.

Type (monotypical), *Aphis berberidis* Kalt.

Genus MASTOPODA Oestlund.

1886. *Mastopoda* Oestlund, Minn. Geol. Surv. Rept. 14, p. 52.

The genus Mastopoda Oestlund, like Gillette's Atarsos, is peculiar in that the tarsi are atrophied.

Characters.—Head without distinct antennal tubercles. Antennæ of five segments. Fore wings with the media twice branched, hind wings with both media and cubitus present. Cornicles somewhat long and cylindrical. Cauda short, conical, Aphis-like. Legs with the tarsi absent and provided instead with a membranous disk which enables the insect to walk inverted on smooth surfaces.

Type (monotypical), *Mastopoda pteridis* Oestlund.

Genus MICROSIPHUM Cholodkovsky.

1908. *Microsiphum* Cholodkovsky, Zool. Anz., v. 32, p. 687.

Characters.—Head without prominent antennal tubercles, although with apparent ones. Antennæ of six segments, rather long and slender. Fore wings with the media twice branched; hind wings with both media and cubitus present. Cornicles very short, not much longer than wide and often scarcely visible in the alate form. Cauda extremely short and subconical or slightly rounded; anal plate rounded.

Type (monotypical), *Microsiphum ptarmicae* Chol.

Genus PERGANDEIDIA Schouteden.

Plate VI, KK-MM.

1903. *Pergandeidia* Schouteden, Zool. Anz., v. 26, p. 685.
1913. *Longicaudus* Van der Goot, Tijd. voor Ent., v. 56, p. 146.
1915. *Rhizoberlesia* Del Guercio, Redia, v. 10, p. 246.
1918. *Yezosiphum* Matsumura, Trans. Sapporo Nat. Hist. Soc., v. 7, pt. 1, p. 7.
1918. *Brachyunguis* Das, Mem. Ind. Mus., v. 6, p. 227.

The genus Pergandeidia was erected by Schouteden with his *ononidis* as type. The characterization of the genus in this paper is based on specimens of the species received from Schouteden, and though it does not agree with the characterization of the genus as sometimes given, it seems necessary to follow the type species in forming a conception of the genus. In 1913 Van der Goot erected the genus Longicaudus and placed *trirhodus* Walker as type. In studying this species differences sufficient for good generic distinction have not been found, and, therefore, the conclusion may be drawn that Longicaudus is a synonym of Pergandeidia. Del Guercio's genus is placed here also, although a study of the type species, which is not available, possibly may show the cauda to be somewhat different.

Characters.—Head with no prominent antennal tubercles; antennæ of six segments. Fore wings with media twice branched, hind wings with both media and cubitus present. Cornicles very short, almost as wide as long. Cauda very long and broad.

Type (monotypical), *Pergandeidia ononidis* Schout.

Genus RHOPALOSIPHUM Koch.

Plate VI, FF-JJ.

1854. *Rhopalosiphum* Koch, Die Pflanz. Aphiden, p. 23.
1860. *Siphocoryne* Passerini, Gli Afidi, p. 28.
1882. *Rhopalosiphon* Scudder, Nomenclator Zoologicus.
1910. *Coloradoa* Wilson, Ann. Ent. Soc. Am., v. 3, p. 323.
1915. *Siphonaphis* Van der Goot, Beiträge zur Kennt. d. Holl. Blattläuse, p. 238.
1918. *Stephensonia* Das, Mem. Ind. Mus., v. 6, p. 175.
1856. (Type fixation) Gerstaecker, Bericht for 1854, p. 162.

There has been much confusion in regard to this genus. Koch included a number of diverse species. In 1856 Gerstaecker definitely set *Aphis nympheae* L. as type. Overlooking this, Passerini in 1860 set *persicae* Sulz. as type. In 1863, however, he changed this name to *dianthi* Schrank. In 1860 Passerini erected the genus Siphocoryne with *A. nympheae* L. as type. Having the same type this must, therefore, become a synonym of Rhopalosiphum. In 1863 Passerini placed *nympheae* in Rhopalosiphum, although he set *dianthi*

as type, and he used Siphocoryne in a different sense with *xylostei* Schrank as type. Such a procedure is inadmissible, and Kirkaldy therefore renamed this genus Hyadaphis.

The genus Coloradoa Wilson was erected with *rufomaculata* Wilson as type. Although much smaller, this species is essentially like *nympheae* in structure, and we therefore consider the genus a synonym of Rhopalosiphum.

The genus Siphonaphis Van der Goot was erected with *nympheae* L. as type. Having the same type, therefore, it must become a synonym of Rhopalosiphum. *Lahorensis* Das is quite similar.

Characters.—Head without prominent antennal tubercles. Antennæ of six segments with the usual subcircular sensoria present. Wing venation normal. Cornicles moderately long and slender, slightly swollen near their distal extremities. Cauda rather elongate, not as long as the cornicles, and not broad. Abdomen without a caudal horn or projection above the cauda. Males usually winged; oviparous females usually apterous.

Type (fixed by Gerstaecker, 1856), *Aphis nympheae* L.

Genus SANBORNIA, n. gen.

Plate VII, F–L.

The genus Sanbornia is erected for a peculiar form living on juniper at College Station, Tex., and forwarded to the Bureau by Charles Sanborn. This species was determined as undescribed by Mr. Pergande who had planned to publish on it. He had given it the name *juniperi*. The type is in the U. S. National Museum (Cat. No. 23064).

Characters.—Head without prominent antennal tubercles. Antennæ of five segments, armed with circular sensoria. Fore wings with the media once branched, hind wings with only the media present, cornicles minute; cauda elongate. Apterous form with four-segmented antennæ and with a prominent mushroom-like projection on the vertex.

Type, *Sanbornia juniperi* Perg.

Sanbornia juniperi Pergande, n. sp.

(Description by Mr. T. Pergande.)

Apterous form.—The head is most remarkable in front, having a large, squarish, bilobed projection about the middle and each side of it; close to the insertion of the antennæ is a prominent, short, and conical protuberance. There is also at the inner side of the first antennal joint a long and slightly conical protuberance. The antennæ are but four-jointed, the spur shorter than the basal section of the joint. Nectaries are not visible (?); the tail is rather long and uniformly elongate conical; the tarsi are very short, the first joint appears to be minute, and in alcoholic specimens seems to be withdrawn into the tibiæ; the last abdominal segment is semicircular.

Genus SIPHONATROPHIA Swain.

Plate VII, A–E.

1918. *Siphonatrophia* Swain, Ent. News, v. 29, p. 363.

Characters.—Head without prominent antennal tubercles. Antennæ of five segments and armed with circular sensoria. Fore wings with the media twice branched; hind wings with both media and cubitus present. Cauda elongate and conical. Cornicles extremely short. Body of apterous form considerably arched.

Type (monotypical), *Cerosipha cupressi* Swain.

Genus YAMATAPHIS Matsumura.

1917. *Yamataphis* Matsumura, Jour. Coll. Agr. Tohoku Univ., v. 7, pt. 6, p. 412.

Characters.—Head without prominent antennal tubercles. Antennæ of five segments armed with small circular sensoria. Fore wings with the media once branched; hind wings with both media and cubitus present. Cornicles subcylindrical. Cauda somewhat conical.

Type (fixed by Matsumura, 1917), *Yamataphis oryzae* Mats.

Genus TOXOPTERA Koch.

Plate VI, DD, EE.

1857. *Toxoptera* Koch, Die Pflanz. Aphiden, p. 253.
1891. *Ceylonia* Buckton, Ind. Mus. Notes, v. 2, p. 35.

Koch's genus was erected for his *aurantiae*, a well-known species on citrus, etc. Buckton erected his genus for a species he described as *theaecola*. Specimens of *aurantiae* from various regions and specimens of *theaecola* from Zehntner substantiate the placing of *theaecola* as a synonym of *aurantiae*. Ceylonia will then become a synonym of Toxoptera. Even if the two species were held to be distinct, this would necessarily be the case.

Characters.—Head without prominent antennal tubercles. Antennæ of six segments, armed with subcircular sensoria. Fore wings with the media once branched, hind wings with both media and cubitus present. Cornicles moderate in length, subcylindric, tapering. Cauda of moderate length, somewhat constricted near the base.

Type (monotypical), *Toxoptera aurantiae* Koch (*aurantiae* Boyer).

Genus VESICULAPHIS Del Guercio.

Plate VII, M–Q.

1911. *Vesiculaphis* Del Guercio, Redia, v. 7, p. 464.

Characters.—Apterous form elongate; antennæ short, composed of five segments and situated on the under side of the head. Top of head forming a ledge which extends out over the antennæ forming an angle in front of the eye; eyes protruding. Cornicles large, very much swollen and curved, opening minute and flanged; cauda somewhat conical, rounded at the tip. Anal plate rounded; posterior part of abdomen extending out over the anal plate and somewhat over the cauda. Alate form with six-segmented antennæ armed with subcircular tuberculate sensoria. Fore wings with the media once branched, hind wings with both media and cubitus present. Cornicles somewhat slender, swollen, and slightly constricted at the tip. Cauda conical, not as long as the cornicles, anal plate rounded.

Type (monotypical), *Toxoptera caricis* Fullaway.

This genus is one of those peculiar genera, like Aspidaphis Gillette, which seem to be related to Rhopalosiphum.

Subtribe CERVAPHIDINA.

The subtribe Cervaphidina is a most interesting and peculiar one. The specialization is remarkable in that long processes are developed on the body and considerable reduction has taken place in the wings and antennæ while no Aphis-like cauda is found. Only two genera are known, which may be separated as follows:

KEY TO THE GENERA OF THE CERVAPHIDINA.

Cornicles swollen; body spine-like projections not armed with teeth....Anomalaphis.
Cornicles not swollen; body spine-like projections armed with teeth.....Cervaphis.

Genus ANOMALAPHIS, n. gen.

Plate VIII, D–F.

Characters.—Body armed with elongate tubercle-like projections, particularly on the caudal portion; antennæ five-segmented in both apterous and alate forms, armed with subcircular sensoria. Fore wings with the media once branched; hind wings considerably reduced, with the cubitus absent. Cornicles distinctly swollen; cauda and anal plate reduced.

Type *Anomalaphis comperei* Pergande.

Anomalaphis comperei Pergande, n. sp.

Among the many descriptive notes left by Mr. Theo. Pergande are some recording a peculiar species from Australia. This proves to represent an undescribed genus in the Cervaphidina. Pergande recognized the species as typical of a new genus to which he gave the manuscript name here used. He left no description of the genus and his notes on the species are given here exactly as he left them. The type is in the United States National Museum collection of Aphididae (Cat. No. 23065).

Feb. 18, 1907, Rec. from Compere, a lot of Aphides, found in 1901, on *Acacia* and *Eucalyptus*, along the beach at Albany, West Australia, which represents a new genus among Rhopalosiphins, and is a most remarkable Aphid in various respects. The antennæ, in the apterous and migratory female, are but 5-jted. while the spur is rather short and resembles that of *Chaitophorus*. The front wings are ample and reach considerably beyond the end of the body, with the third discoidal having but one fork, as in *Schizoneura*. The hind wings are very short and narrow and reach out to the apex of the 1st vein of the anterior wings, there is also but 1 discoidal, straight, and near the apex of the wing. The nectaries are short, clavate, and similar to those of *Siphocoryne*, the tail appears to be wanting. The abdomen of the migrant appears to have been of a dusky yellowish green, with transverse rows of small, black spots or tubercles, and blackish sutures between the segments. The eyes are brown; antennæ black, rather short, reaching barely to the abdomen and but 5-jointed; the two basal joints as usually; the 3rd joint is longest, about as long as the remaining joints together, including the spur, with some projecting sensoria and a few short hairs; joints 4 and 5 are subequal in length, exclusive of the spur, and clavate, the spur is about ½ the length of the basal section of the joint, rather stout and blunt; the front of the head resembles that of *Aphis*. The sides of the abdominal segments are somewhat angulated, each angle provided with a very short, capitate, stout bristle, while at the posterior edge of the two segments, following the nectaries, there is a pair of long,

diverging, fleshy spines, with a sharp, quite long and slender spine at the tip; the posterior pair longest; all of them black; the end of the body is fringed with fine and quite long hairs. Legs as in other Aphides.

The apterous females are dark brownish or grayish green above, with a somewhat fusiform median, yellowish strip, broadest near the head, tapering posteriorly to a point and terminating in front of nectaries; the sutures of the segments, the sides and under side of the body are also of a yellowish color, on account of which, there is each side a subdorsal row of transverse, dark spots. The head and about basal half of the antennæ, dark, dirty yellowish, the eyes dark brown. There are about 4 short and curved capitate hairs on the front of the head and prominent fleshy tubercles each side of the body, each bearing at its apex a short, capitate spine or hair, all of them growing longer toward the nectaries, while beyond the nectaries there are two pairs of long and slender fleshy tubercles, tipped with a spine, as in the migrant. A tail could not be seen. In the younger forms and pupae, the tubercles are as in the apterous female. In the pupae the head, prothorax, abdomen and nectaries are of a dirty yellowish color, with transverse rows of small, black or dusky spots on the abdomen. The wing pads are black.

Genus CERVAPHIS Van der Goot.

Plate VIII, G.

1916. *Cervaphis* Van der Goot, Zur Kenntniss der Blattläuse Java's, p. 148.

Characters.—Body armed with a series of long toothed projections; antennæ of apterous form five-segmented, of the alate form six-segmented with somewhat oval sensoria. Fore wings with the media once branched; hind wings greatly reduced in size and lacking both the media and cubitus; cornicles elongate, subcylindric. Cauda and anal plate reduced. Oviparous females often winged.

Type (fixed by Van der Goot, 1916), *Cervaphis schoutedeniae* V. d. Goot.

Subtribe MACROSIPHINA.

The genera of the subtribe Macrosiphina may be separated at once from those of the Aphidina in that they have developed large antennal tubercles. These may assume various shapes by which the genera often may be separated. Considerable variation is met with also in the cornicles and cauda, although as a rule the cornicles are very well developed. They may be either cylindrical or swollen. In one genus, Hyalopteroides Theo., the cornicles are very short, suggesting some of the genera of the Aphidina. The cauda is as a rule rather long. The wings are in nearly every case normal in venation. The different genera may be separated by the following key:

Key to the Genera of the Macrosiphina.[1]

1. Cornicles swollen ..... 2.
   Cornicles cylindrical or tapering, scarcely swollen ..... 6.

[1] Since this paper was set up Takahashi (Insect World, v. 23, p. 439) has erected the following genus, which will fall in this subtribe.

Genus AKKAIA Takahashi.

Characters.—Cornicles swollen; frontal tubercles and first antennal segment with prominent projections. Antennæ of five segments. Cauda somewhat knobbed, anal plate large and projecting.

Type (monotypical), *Akkaia polygine*, Takahashi.

2. Cornicles cylindrical at base and extremity; abruptly swollen in middle.. Rhopalosiphoninus.
   Cornicles with the swelling gradual..... 3.
3. Head with a large central process on vertex.....Francoa.
   Head without this..... 4.
4. Antennal tubercles large and diverging..... 5.
   Antennal tubercles converging; head and basal antennal segments with very prominent capitate hairs.....Capitophorus.
5. Cornicles much longer than cauda which is somewhat tapering..Amphorophora.
   Cornicles about the length of cauda which is usually constricted near its base.....Megoura.
6. Cornicles very small, much smaller than the long, broad cauda..Hyalopteroides.
   Cornicles as long as or longer than the cauda..... 7.
7. Head with prominent, elongate projections to the antennal tubercles, particularly evident in the apterous form.....Phorodon.
   Head without these..... 8.
8. Tubercles strongly converging.....Myzus.
   Tubercles distinctly diverging..... 9.
9. Cornicles thick, about as long as the cauda which is large and somewhat constricted near base.....Macrosiphonella.
   Cornicles very long, rather slender, subcylindric, somewhat tapering..... 10.
10. Cauda elongate, constricted near base.....Macrosiphum.
    Cauda moderate or elongate, not constricted near base..... 11.
11. First antennal segment and abdominal segments with long fingerlike tubercles in the apterous form.....Acanthaphis.
    Without these.....Illinoia.

Genus ACANTHAPHIS Matsumura.

Plate VII, R-U.

1918. *Acanthaphis* Matsumura, Trans. Sapporo Nat. Hist. Soc., v. 7, pt. 1, p. 15.

The genus Acanthaphis Mats. is somewhat related to Phorodon.

Characters.—Head with prominent diverging antennal tubercles. Antennæ of six segments, first segment with a long fingerlike projection in the apterous form. Cornicles long, slender, and cylindrical. Cauda elongate, conical. Dorsum of abdomen with long fingerlike tubercles. Body with capitate hairs.

Type (fixed by Matsumura, 1918), *Acanthaphis rubi* Mats.

Genus AMPHOROPHORA Buckton.

Plate IV, A, B.

1876. *Amphorophora* Buckton, British Aphides, v. 1, p. 187.
1886. *Macrosiphum* Oestlund, Minn. Geol. Survey Rept. 14, p. 27.
1900. *Macrosiphum* Del Guercio, Nuove Rel. Staz. Firenze, ser. 1, no. 2, p. 159.
1901. *Nectarosiphon* Schouteden, Ann. Ent. Soc. Belg., v. 45, p. 112.
1913. *Eunectarosiphon* Del Guercio, Redia, v. 9, p. 188.
1913. *Rhopalosiphum* Van der Goot, Tijd. voor Ent., v. 56, p. 146.

Buckton erected his genus Amphorophora for his *ampullata* which he had secured in the apterous form only. Oestlund gave the generic name Macrosiphum to a species he described as *rubicola*. In his second paper Oestlund describes a species under the name *ampullata* Buckton and says:[1] "The length of the antennæ, together with the distinct frontal tubercles, may justify our exception of Amphorophora as a good genus." In speaking of his Macrosiphum

[1] Bul. 4, Geol. and Nat. Hist. Surv. Minn., p. 77, 1887.

Oestlund says it may be too close to Rhopalosiphum and compares it with *nymphaeae*. But had he compared it with *ampullata* which he also included in Rhopalosiphum he would probably have found it quite similar, and it is the writer's belief that Oestlund's species is in reality Amphorophora.

Finding that Macrosiphum was preoccupied Schouteden gave the new name Nectarosiphon to *rubicola* and Nectarosiphon, therefore, will become a synonym. In 1913, Del Guercio erected the genus Eunectarosiphon with *rubi* Kalt. as type. There appears not to be sufficient difference here, however. The insects are in their main points the same and Eunectarosiphon is placed, consequently, as a synonym. Van der Goot in the same year used *ampullata* as the type of Rhopalosiphum.

In 1900 Del Guercio used the name Macrosiphum for a genus including three species: *Convolvuli* Kalt., *viciae* Kalt., and *rubi* Kalt. He has since used both *viciae* and *rubi* as the types of other genera. This leaves only *convolvuli* in his Macrosiphum, and this species to all appearances is an Amphorophora. His Macrosiphum, therefore, is listed here under Amphorophora.

Characters.—Head with prominent and slightly diverging antennal tubercles. Antennæ of six segments, armed with circular sensoria. Wing venation normal. Cornicles long and somewhat swollen in the middle. Cauda elongate but much shorter than the cornicles.

Type (monotypical), *Amphorophora ampullata* Buckton.

Genus CAPITOPHORUS Van der Goot.

Plate VIII, A–C.

1913. *Capitophorus* Van der Goot, Tijd. voor Ent., v. 56, p. 84.

In the genus Capitophorus Van der Goot certain species suggest Rhopalosiphum in general characters, whereas others more nearly approach Myzus in their main characters. The capitate spines appear to be the best means of determining the genus.

Characters.—Head with antennal tubercles which are not markedly prominent, these each with one or more prominent knobbed spines. Vertex with a central projection on which similar spines are located. Antennæ of six segments, armed with subcircular sensoria, the first segment with a projecting process on which one or more knobbed spines are located. Wing venation normal; cornicles long and slender, slightly constricted in the middle and somewhat enlarged toward the distal extremity. Cauda rather short and conical.

Type (fixed by Van der Goot, 1913), *Aphis carduinus* Walker.

Genus FRANCOA Del Guercio.[1]

1917. *Francoa* Del Guercio, Redia, v. 12, p. 201.

The genus Francoa Del Guercio appears very close in some respects to Capitophorus but on account of the peculiar frontal tubercle and the structure of the first antennal segment it is held to be distinct.

[1] It seems doubtful if this genus is distinct from Capitophorus. We have been unable to make a careful study of the type.

Characters.—Head with antennal tubercles present. Vertex with a prominent rectangular process, both the antennal tubercles and the frontal process armed with knobbed spines. Antennæ of six segments, the first segment lacking the process and capitate hairs of *Capitophorus*. Cornicles rather slender and swollen near the distal extremity. Cauda elongate, somewhat conical.

Type (monotypical), *Francoa elegans* Del Guercio.

Genus HYALOPTEROIDES Theobald.

1916. *Hyalopteroides* Theobald, The Entomologist, v. 49, p. 51.

The genus Hyalopteroides was erected by Theobald for his species *pallida* found in the nest of *Lasius niger*, Porlock Weir, Somerset. It bears a striking resemblance to Pergandeidia but there are no prominent antennal tubercles in that genus. However, there are slight swellings suggestive of those figured by Theobald. The writer has never seen specimens of *pallida* and therefore is unable to give a personal opinion. Theobald says, "Head with marked frontal tubercles." This would place the genus as not closely related and pending a study of specimens it may be left thus.

Characters.—Head with prominent antennal tubercles. Antennæ of six segments and armed with subcircular sensoria. Cornicles subcylindric, short, much shorter than cauda. Cauda long and conical.

Type (monotypical), *Hyalopteroides pallida* Theo.

Genus ILLINOIA Wilson.

Plate VIII, H–J.

1910. *Illinoia* Wilson, Ann. Ent. Soc. Am., v. 3, p. 318.
1914. *Metopeurum* Mordwilko, Faune de la Russie, Hemiptera, , v. 1, p. 56, 67.
1914. *Acyrthosiphon* Mordwilko, Faune de la Russie, Hemiptera, v. 1, p. 55, 62.

This genus is closely related to Macrosiphum Pass. from which it may be distinguished by the nature of the cauda.

Characters.—Head with prominent diverging frontal tubercles. Antennæ of six segments armed with subcircular sensoria. Fore wings with the media twice branched, hind wings with both media and cubitus present. Cornicles cylindrical, sometimes slightly larger toward the middle which appearance is accentuated by a constriction often present near the distal extremity. Cauda conical, not as in Macrosiphum with a constriction near its base. Males usually winged, oviparous females apterous.

Type (fixed by Wilson, 1910), *Siphonophora liriodendri* Mon.

Genus MACROSIPHONIELLA Del Guercio.

Plate VIII, R–T.

1911. *Macrosiphoniella* Del Guercio, Redia, v. 7, p. 331.
1913. *Macrosiphum* Van der Goot, Tijd. voor Ent., v. 56, p. 145.
1914. *Dielcysmura* Mordwilko, Faune Russ. Aphidodea, p. 56.

The genus Macrosiphoniella was erected by Del Guercio with *atrum* Ferr. as type. In 1913 Van der Goot used Macrosiphum of Passerini, indicating *millefolii* Fab. as type. This species can not be made the type of Macrosiphum Pass., and since it is essentially like *atrum*, V. d. Goot's Mascrosiphum must become a synonym of Macrosiphoniella. In 1914, Mordwilko used the generic name Dielcysmura for *millefolii* and figured the species. This name then proves also to be a synonym.

Characters.—Head with prominent diverging antennal tubercles. Antennæ of six segments armed with subcircular prominent sensoria. Fore wings with the media twice branched, hind wings with both media and cubitus present. Cornicles short, about the length of the cauda and rather thick, usually with conspicuous polygonal markings; cauda large, slightly constricted near the base.

Type (fixed by Del Guercio, 1911), *Aphis atrum* Ferr.

Genus MACROSIPHUM Passerini.

Plate VIII, U–W.

1860. *Macrosiphum* Passerini, Gli Afidi, p. 27.
1855. *Siphonophora* Koch, Die Pflanzenläuse Aphiden, p. 150.
1887. *Nectarophora* Oestlund, Minn. Geol. Survey Bul. 4, p. 78.
1913. *Macrosiphon* Del Guercio, Redia, v. 9, p. 188.

In 1855 Koch used the generic name Siphonophora for this genus for which Passerini substituted Macrosiphum. Not aware of this Oestlund, seeing that Siphonophora was preoccupied, substituted Nectarophora and strangely enough used Macrosiphum for another genus in a different sense. Del Guercio uses Macrosiphon in this sense.

Characters.—Head with prominent diverging frontal tubercles. Antennæ of six segments, armed with subcircular sensoria. Fore wings with the media twice branched; hind wings with both media and cubitus present. Cornicles long, subcylindrical, mostly somewhat tapering; cauda long, somewhat constricted about the middle. Sexes with the male usually alate and the oviparous form apterous.

Type (fixed by Passerini, 1860), *Aphis rosae* Linn.

Genus MEGOURA Buckton.

1876. *Megoura* Buckton, British Aphides, v. 1, p. 188.
1913. *Drepaniella* Del Guercio, Redia, v. 9, p. 188.

The genus Megoura Buckton is similar to Amphorophora in that prominent antennal tubercles are present. It differs, however, in that the cornicles are short, about equal in length to the cauda. Buckton erected the genus for his *viciae* which Schouteden considered the same as *viciae* Kaltenbach. It certainly is very similar in every respect.

Viciae Kalt. was set as the type of his genus Drepaniella by Del Guercio, therefore Drepaniella will become a synonym of Megoura.

Characters.—Head with distinct antennal tubercles. Antennæ of six segments, armed with subcircular sensoria. Wing venation normal; cornicles moderately long and swollen in the middle. Cauda about the same length as the cornicles.

Type (monotypical), *Megoura viciae* Buckton.

Genus MYZUS Passerini.

Plate VIII, L, M, X–Z.

1860. *Myzus* Passerini, Gli Afidi, p. 27.
1860. *Rhopalosiphum* Passerini, Gli Afidi, p. 27.
1913. *Myzoides* Van der Goot, Tijd. voor Ent., v. 56, p. 84.
1913. *Ovatus* Van der Goot, Tijd. voor Ent., v. 56, p. 84.
1914. *Myzodes* Mordwilko, Faune Russ. Aphidoidea, p. 52.
1914. *Aulacorthum* Mordwilko, Faune Russ. Aphidoidea, p. 58.
1916. *Neomyzus* Van der Goot, Zur Kennt. der Blattläuse Java's, p. 50.
1918. *Myzopsis* Matsumura, Trans. Sapporo Nat. Hist. Soc., v. 7, pt. 1, p. 19.

The genus Myzus was erected with *Aphis cerasi* Fab. as type. In the same year Passerini used *Aphis persicae* Sulz. as type of Rhopalosiphum Koch. *Aphis nymphaeae* L., however, had been set as the type of that genus in 1856. *Persicae* seems to be very closely related to *cerasi* and Rhopalosiphum (Koch) Pass., therefore, is placed as a synonym of Myzus.

In 1913 Van der Goot placed certain other species in Myzus and the type of the genus he made the type of his Myzoides. This will evidently then become a synonym, as it has the same type.

In 1916 Van der Goot erected the genus Neomyzus with *circumflexum* Buckt. as type. While the frontal tubercles of this species do not converge quite to the same extent as those of *cerasi*, they are quite similar and the cauda is somewhat conical as in that species. Neomyzus, therefore, is believed to be a synonym. Mordwilko used the name Myzodes with *tabaci* Mord. as type. This species he does not fully describe, but gives a figure and describes the characters of the genus. From the information given it appears to be a synonym of Myzus. The writer also believes that the genus Ovatus V. d. Goot is a synonym of Myzus. This genus was erected with *mespili* V. d. Goot as type. The genus Aulacorthum Mord. was erected with *pelargonii* as type. A study of this species shows the antennal tubercles very similar to those of *cerasi*. The cornicles, too, are quite similar, although the cauda is a little more Aphis-like. The writer believes this genus is a synonym.

Characters.—Head with distinct antennal tubercles present which, particularly in the apterous form, project inward and are strongly gibbous. Antennæ of six segments, the first segment gibbous like the antennal tubercles. Wing venation normal. Cornicles rather long and subcylindrical. Cauda somewhat short and conical, constricted very slightly, if at all.

Type (fixed by Passerini, 1860), *Aphis cerasi* Fab.

Genus PHORODON Passerini.

Plate VIII, N–Q.

1860. *Phorodon* Passerini, Gli Afidi, p. 27.

Characters.—Head in the alate form with distinct antennal tubercles which project somewhat inward, first antennal segment gibbous. In the apterous form the antennal tubercles possess very prominent projections which extend forward in front of the head. First antennal segment with a projecting process. Fore wings with media twice branched; hind wings with both media and cubitus present. Cornicles cylindrical, in the apterous form somewhat curved; cauda rather acutely conical, not as long as the cornicles.

Males as a rule winged and oviparous females apterous.

Type (fixed by Passerini, 1860), *Aphis humuli* Schrk.

Genus RHOPALOSIPHONINUS, n. gen.

Plate IV, D–F.

The genus Rhopalosiphoninus is erected for *latysiphon* Davidson, a species with very peculiar cornicles. It appears to be somewhat related to Amphorophora.

Characters.—Head with prominent antennal tubercles which project inward and are armed with prominent spines. Antennæ of six segments armed with subcircular sensoria and in the first segment with spines similar to those of the antennal tubercles. Wing venation normal. Cornicles narrow and cylindrical at the base, then abruptly and prominently swollen, returning again abruptly to the normal size near the tip. Cauda rather short and conical.

Type, *Amphorophora latysiphon* Davidson.

Subtribe PENTALONINA.

The subtribe Pentalonina is one of the Aphidini in which specialization in the wing venation has taken place in a peculiar manner. The radial sector has in one genus extended downward and coalesced with the upper branch of the media. In the genus Idiopterus the two have not become entirely fused, though in some specimens they have almost done so. In Pentalonia, however, the veins have become permanently united, and a very peculiar-looking venation is the result. A closed cell is formed by the radial sector when it meets the upper branch of the media, and when it leaves this again it gives a three-branched appearance to the upper branch of the media. The explanation of this peculiar venation is, however, easily understood by comparison with the venation of Idiopterus. In some of the genera the hind wings are greatly reduced, so that sometimes only one vein remains, while in other genera this reduction has not taken place. Most of the wing veins are clouded with brownish borders.

The insects feed usually upon ferns or tropical plants.

Key to the Genera of the Pentalonina.

1. Hind wings much reduced in size, lacking at least the cubitus ..... 2.
   Hind wings nearly normal in size and with both media and cubitus present. 3.
2. Radial sector of fore wing fused with the upper branch of the media, forming a closed cell..... Pentalonia.
   Radial sector of fore wings not so fused, but normal ..... Microparsus.
3. Cornicles cylindrical..... Idiopterus.
   Cornicles somewhat swollen near their distal extremities..... 4.
4. Media of fore wings twice branched.....Fullawayella.
   Media of fore wings once branched.....Neotoxoptera.

Genus FULLAWAYELLA Del Guercio.

1911. *Fullawayella* Del Guercio, Redia, v. 7, p. 462.
1916. *Micromyzus*, Van der Goot, Zur Kenntniss der Blattläuse Java's, p. 55.

This genus is very suggestive of Amphorophora in certain ways but no doubt is related here. Van der Goot's genus was erected with *nigrum* V. d. Goot as type but this species differs very little from *kirkaldyi*.

Characters.—Antennæ on prominent, converging, imbricated antennal tubercles, of six segments and armed with subcircular sensoria. Fore wings with the media twice branched and with the radical sector deeply curved toward the upper branch of the

media; hind wings with both media and cubitus present. Cornicles somewhat swollen near their distal extremities. Cauda elongate and constricted near the base.

Type (monotypical), *Macrosiphum kirkaldyi* Fullaway.

Genus IDIOPTERUS Davis.

Plate VIII, EE–HH.

1900. *Idiopterus* Davis, Ann. Ent. Soc. Amer., v. 2, p. 198.

Idiopterus, a less specialized genus than Pentalonia, is worthy of special note, as it gives a key to the peculiar venation of the latter genus. The coalescing of the radial sector and the media is here plainly visible and in some specimens a triangular closed cell is formed, although in most examples the two veins can be traced distinctly.

Characters.—Head with prominent antennal tubercles which project slightly inwards, and are gibbous. Antennæ of six segments, armed with subcircular sensoria, the first segment gibbous like the antennal tubercles. Cornicles subcylindric, rather slender, cauda somewhat elongate, conical. Fore wings with the radial sector extending abruptly downward from the stigma and paralleling the upper branch of the media with which in some specimens it appears to be almost united; hind wings with both media and cubitus present.

Type (monotypical), *Idiopterus nephrolepidis* Davis.

Genus MICROPARSUS Patch.

Plate VIII, AA–DD.

1909. *Microparsus* Patch, Ent. News, v. 20, p. 337.

Microparsus is at once distinguished from the other genera related to it by the peculiar venation and the reduction of the hind wing.

Characters.—Head with distinct antennal tubercles present. Antennæ of six segments, armed with subcircular sensoria. Fore wings with the media once branched; hind wings much reduced in size and lacking both the media and cubitus. Cornicles subcylindric. Cauda rather long and tapering, almost equal in length to the cornicles.

Type (monotypical), *Microparsus variabilis* Patch.

Genus NEOTOXOPTERA Theobald.[1]

1915. *Neotoxoptera* Theobald, Bul. Ent. Res., v. 6, p. 131.

This genus is closely related to Fullawayella, from which it can be separated by the venation. There has been some doubt whether or not this is a good genus, for the name will not hold if the type is found to correspond with Pergande's *violae*, which it resembles. In that case Neotoxoptera would become a synonym of Fullawayella, for Pergande's species is undoubtedly a Fullawayella.

Characters.—Head with prominent antennal tubercles. Antennæ of six segments, armed with subcircular sensoria. Fore wings with the media once branched. Cornicles swollen, elongate, somewhat conical.

Type (monotypical), *Neotoxoptera violae* Theo.

[1] After this paper was in type the writer (Bul. Ent. Res., v. 10, p. 45) showed that *violae* Theo. is a synonym of *violae* Perg.

Genus PENTALONIA Coquerel.

Plate VIII, II–MM.

1859. *Pentalonia* Coquerel, Ann. Ent. Soc. France, Ser. 3, v. 7, p. 259.

The genus Pentalonia Coquerel is a very peculiar one and possesses a venation unlike that of any other in the Aphididae. It is, however, only a little further development of the condition met with in Idiopterus, which is the less specialized of the two genera.

Characters.—Head with prominent antennal tubercles which are, more especially in the apterous form, projected inward, gibbous and somewhat Myzus-like in appearance. Antennæ of six segments, armed with subcircular sensoria, the first segment gibbous like the antennal tubercles. Cornicles somewhat constricted near their middle, then again somewhat swollen near their distal extremity. Cauda rather small but elongate, subconical, slightly constricted about the middle. Fore wings with the radial sector extending abruptly downward and meeting the upper branch of the media with which it fuses but is diverted again toward its natural course near the tip of the wing. A closed cell is thus formed by the radial sector and the media but at the margin of the wing there are the same veins as in the Aphidini (Plate VIII, JJ.) Hind wings very much reduced, cubitus absent.

Type (monotypical), *Pentalonia nigronervosa* Cql.

Subfamily II, MINDARINAE.

It has been the custom to consider the genus Mindarus as closely related to the Pemphigini, but the writer is unable to do this and concludes that it must represent a subfamily in itself. In some ways *abietinus* is the most primitive living aphid. It is, in fact, the only one which has retained the general wing structure which is predominant in the fossil forms. It is true that the venation is more reduced than in some of the other subfamilies, but the type of wing in regard to the stigma formation is exactly like most fossil wings and unlike the wings of other living forms. Many of the characters suggest the Eriosomatinae and the genus is no doubt very similar to the ancestors of the insects in that subfamily. The antennal structure and general form are like those in the Eriosomatinae. The sexes, too, are apterous, but though they have developed the small apterous condition they are in many ways more primitive than are the sexes of the Eriosomatinae. The male is small and suggests the condition in those forms. The peculiar habit of copulation is similar, in that the male mounts the female and may remain there inactive for a very long period. The writer has observed a male of *Eriosoma lanigerum* clinging thus to a female for 48 hours. The sexes of Mindarus, however, have not lost the beak and the male feeds on the juices of its host. In this regard they are more primitive than sexes in the Eriosomatinae. The oviparous female, moreover, develops her ovaries and produces as high as 8 or 9 eggs, in striking contrast with the ovipara in the Eriosomatinae. It is a much less specialized condition. In regard to the alate form the shape of the cauda is quite different from that met with in the Eriosomatinae.

It seems to the writer that the Mindarinae give a fair idea of the ancestors of the Eriosomatinae and may even represent a group dominant in earlier times from which the Eriosomatinae sprang.

Only one genus is represented.

Genus MINDARUS Koch.

Plate IX, A–F.

1857. Koch, Die Pflanzenläuse Aphiden, p. 277.

The peculiar genus Mindarus was erected by Koch with *abietinus* Koch as type. This species is the only one in the genus, although it has been redescribed as *Schizoneura pinicola* Thos. and *Schizoneura obliqua* Chol.

Characters.—Cornicles present as mere rings. Large wax plates present. Alate forms with six-segmented antennæ armed with oval sensoria. Fore wings with the media once branched; radial sector inserted mesad of the long narrow stigma, thus giving a very long stigmal cell; hind wings with both media and cubitus present. Cauda rather long, not rounded, but somewhat conical or even spatulate. Sexes small and apterous, beaks present and feeding taking place. Oviparous female with the ovaries developed and laying as high as 9 eggs. Forms living free upon the twigs of conifers which become somewhat distorted by the feeding of the insects.

Type (monotypical), *Mindarus abietinus* Koch.

Subfamily III, ERIOSOMATINAE.

The subfamily Eriosomatinae is composed of insects which are perhaps as specialized as any of the Aphididae. They show a remarkable development of the habit of gall formation and in this respect parallel the Hormaphidinae. The insects of that subfamily, however, evidently have developed the habit independently. Many previous authors have placed all of these forms in the present subfamily. This, the writer believes, is incorrect, as shown by the biologies of the insects. The sexual forms give a true understanding of the relationships and of the genera which should be included in the Eriosomatinae. All of the forms included by the writer show evidence of a common origin in that the sexes have become degenerate. They have become small apterous forms and have lost the mouth parts and the ability to take food. That this was not their original condition is clearly shown by the history of the family and also by the fact that the sexual forms of some species have a beak when born, but lose this at the first molting. Other species even at the time of birth are devoid of all but a rudimentary trophictubercle. The reproductive system of the female has become greatly altered. As previously pointed out by the writer, the early development of the reproductive system of the sexual female corresponds exactly to that in the apterous forms and to that of the oviparous forms of the more primitive groups.

Young embryos * * * show that the ovaries are at first similar to those of the parthenogenetic form. There may be distinguished the four chambers on each side containing egg cells and nutritive cells. In later embryos most of the egg tubes are in

the process of degeneration and only two ovaries, one on each side, develop. Of these one finally degenerates and the egg of the other grows until it fills almost the entire body and the insect appears to be little else than egg.[1]

It will be seen at a glance that such a method of egg development is entirely different from that met with in members of the genera which have been heretofore placed in the subfamily. The Hormaphidini and the Thelaxini, as will be seen under the discussion of those tribes, have sexual females which develop normal ovaries and lay several eggs in the same way as do the Aphidini, Lachnini, and other groups. It is true that some have developed gall formation and highly specialized, wax-secreting organs, but this is more of a parallelism than a close relationship, as is indicated by the sexual forms. The wax-secreting organs of the Eriosomatinae vary considerably in structure. A study of those in the genus Eriosoma has been presented by the writer (1915). The glands here are compound, each cell containing a central wax chamber into which the wax is secreted and from which it is forced out as a fine waxen thread. In other genera the wax glands take on the nature of plates, illustrated in the genus Prociphilus. These glands are essentially the same in general structure as are those in Eriosoma, but the wax cells are placed very close together and are so extremely elongate that their openings to the surface are very small. A large number of these gives the appearance of a more or less uniform plate. The structure, however, in the two genera follows the same lines.

The wing venation in this subfamily presents as great a reduction as in any of the subfamilies of the Aphididae and in this respect it is comparable to the Hormaphidinae. In the fore wings the reduction is shown in the media which is never branched more than once. Dr. Patch has pointed out the homologies of the veins and has indicated that in all of these cases the branches represent M_{1+2} and M_{3+4}. In some cases, however, it would appear as if they were M_1 and M_4. In other genera the media is indicated as a single vein. The radial sector is in nearly every case present and the cubitus and first anal are prominent veins. The tracheae are figured for the subfamily under the genus Eriosoma. In the hind wings the radial sector is always present and two oblique veins are nearly always found. These are the media and the cubitus. In several genera, however, the cubitus has disappeared and only the media remains as the one transverse vein in the hind wings.

The cornicles in the genera of this subfamily are not prominently developed. Indeed, they are absent altogether in certain of the tribes. In the genus Eriosoma they are chitinized rings slightly elevated on shallow hairy cones. The opening of the cornicles is closed by a muscle and from the cornicle a narrow duct leads to a

[1] Baker, A. C. The woolly apple aphis. U. S. Dept. Agr., Off. of Sec., Rept. 101, p. 43. 1915.

large wax reservoir. The structure of the cornicles themselves in this subfamily is essentially the same in all genera where they are present. In a large number of genera, however, the wax reservoir is absent and in some specialized tribes the cornicles are likewise absent. It is interesting to note that in some genera, though absent in the stem mother, they are present in the alate forms.

The habit of gall formation is not found equally in all genera and it would seem that those forms which have become associated with ants have not developed this habit to the same extent as have some of the other groups. However, it must be borne in mind that our knowledge concerning the species associated with ants is very incomplete, and the writer is convinced that many of the Prociphilini will be found during their summer generations in this relation. Many of the forms cause true galls which are the result of outgrowths of the plant and which completely enclose the insects. Sometimes the stem mother lives in a gall by herself while in other cases the following generations live with her. The original spring gall is usually the result of the activities of the young stem mother. Certain species do not produce true galls but form pseudogalls which are due to the rolling or crumpling of the leaves on which the insects feed. Other species, again, especially during their summer generations, feed on the twigs or roots of plants and give rise to excrescences by their feeding. It often happens that species which in their spring forms are gall makers, attack plants in this way in their summer generations. Others live on the roots of grasses during these generations and do not cause the excrescences produced by those species feeding on trees and woody shrubs.

The association with ants is highly developed by one tribe of this subfamily, although all of the other tribes are to a degree tended by these insects. The species of the Fordini live exclusively in the nests of ants or are tended by them, and they are cared for very carefully in return for the honeydew excreted. Ants also attend species which have aerial feeding habits and they may be seen carrying the root generations of species of Eriosoma from one place to another and even distributing them about on the trees. Indeed the writer once took advantage of the presence of ants to infest some apple seedlings. A vial of apterous insects was emptied at the base of each tree and the ants soon could be seen running about carrying the aphids to suitable positions on the trees. Sometimes, however, they carried them away.

KEY TO THE TRIBES OF THE ERIOSOMATINAE.

1. Cornicles present, at least in the alate forms; however, often mere rings.... 4.
   Cornicles absent.... 2.
2. Forms living in true galls or in pseudogalls on plants.... 3.
   Forms living in the nests of ants or at least subterranean, feeding on the roots of plants; wax-secreting areas present; antennæ of alate forms rather short and thick with somewhat oval sensoria.... FORDINI.
3. Forms living in true galls and without wax plates prominently developed on the head and thorax of alate form; wax-secreting areas present but not prominently developed. Alate forms leaving the galls in the late summer or fall. Antennæ with annular sensoria.... MELAPHINI.
   Forms living in pseudogalls, occasionally in true galls. Antennæ of alate form rather long and slender, with narrow or somewhat oval or rounded sensoria. Wax plates well developed and present on the head and thorax of the alate forms which leave the galls in the spring.... PROCIPHILINI.
4. Forms living in galls, pseudogalls, or free upon their host; wax glands prominently developed; antennæ of alate forms armed with annular sensoria which almost completely encircle the segments.... ERIOSOMATINI.
   Forms living usually in true galls; wax glands present but not strongly developed; antennæ of alate forms armed with narrow, transverse sensoria, somewhat oval or irregular ones, or occasionally without sensoria.. PEMPHIGINI.

Tribe ERIOSOMATINI.

The tribe Eriosomatini is composed of insects which have more or less developed the habit of gall formation, which are possessed of wax glands, and the antennæ of the alate forms of which are armed usually with annular sensoria. Their typical host group is that of the elms.

Characters.—Forms living in galls, pseudogalls, or free upon the twigs or roots of their host on which they form excrescences. Prominent wax glands present. Cornicles distinct; antennæ of alate forms armed with annular sensoria which often almost completely encircle the segments. Sexual forms small, apterous, beakless; oviparous females developing a solitary egg.

KEY TO THE GENERA OF THE ERIOSOMATINI.

1. Media of the fore wings of alate form once branched.... 3.
   Media of the alate form simple.... 2.
2. Hind wings with both media and cubitus present.... Gobaishia.
   Hind wings with only the media present.... Tetraneura.[1]
3. Hind wings with both media and cubitus present.... Eriosoma.
   Hind wings with only the media present.... 4.
4. Stem mother with four-segmented antennæ; antennæ of alate form rather short and thick.... Colopha.
   Stem mother with five-segmented antennæ; antennæ of alate form long and slender.... Georgia.

[1] There is considerable evidence for separating a tribe Tetraneurini to include the genera Colopha, Tetraneura, and Gobaishia.

Genus COLOPHA Monell.

Plate IX, G–L.

1877. *Colopha* Monell, Can. Ent., v. 9, p. 102.

The genus Colopha was erected for *ulmicola* Fitch. One of the principal characters whereby it may be separated from Tetraneura is the once-branched character of the media. The two genera, however, are very closely related. The species have the same peculiar structure and the same mode of life.

Characters.—Cornicles slightly elevated rings. Stem mother with four-segmented antennæ. Apterous form with five-segmented or sometimes six-segmented antennæ. Wax glands present. Alate form with six-segmented antennæ which are armed with annular sensoria partly encircling the segments. Fore wings with the media once branched, hind wings with only the media present. Forms making galls upon the leaves of trees in which the stem mother and her offspring live in company; in summer migrating to the roots of plants.

Type (monotypical), *Byrsocrypta ulmicola* Fitch.

Genus ERIOSOMA Leach.

Plate IX, M–T.

1818. *Eriosoma* Leach, Trans. Hort. Soc. London, v. 3, p. 60.
1831. *Myzoxylus* Blot, Mem. Soc. Roy. Agr. et de Com. Caen., v. 3, p. 332.
1837. *Schizoneura* Hartig, Jahresb. ü. d. Fortschr. d. Forstwiss. und forstl. Naturk., v. 1, p. 645.
1848. *Mimaphidus* Rondani, Nuovi Annali della Scienze Naturali, ser. 2, v. 9, p. 35.

In 1818 Leach erected his genus in a footnote in connection with a paper read by Mosley. The paper was published in 1818. In 1819 Samouelle published his "Useful Compendium" and on page 232 characterized the genus Eriosoma Leach MSS. The printed copy of the Transactions appeared complete in 1820. In 1824 Blot used the word Myzoxyle which he corrected to Myzoxylus in 1831. For these *Aphis lanigera* Hausm. was used as type.

In 1837 Hartig erected Schizoneura and of this genus *ulmi* was made type by Passerini in 1860. This then will become a synonym. *Corni* Fab. was for a time considered the type of this genus but this species was not in the original genus. In 1848 Rondani used Mimaphidus with *ulmi* Fab. as type, which according to Passerini is the same as *lanuginosa* Hartig. Therefore, this genus will become a synonym.

Characters.—Cornicles distinct rings on somewhat elevated tubercles. Apterous form with six-segmented antennæ. Stem mother with five-segmented antennæ. Wax plates present in the apterous and alate vivipara. Alate form with six-segmented antennæ armed with annular sensoria. Fore wings with the media once branched, hind wings with both media and cubitus present; cauda and anal plate rounded. Forms living in gall-like formations or causing excrescences on their hosts. Sexual forms small, apterous, beakless. Only one egg of those of the oviparous female develops.

Type (monotypical), *Aphis lanigera* Hausmann.

Genus GEORGIA Wilson.

Plate IX, U–Z.

1911. *Georgia* Wilson, Can. Ent., v. 43, p. 64.

The genus Georgia appears to be related to Colopha Mon., and yet many of the characters are so like those of Eriosoma that the insect suggests that genus also. Especially to the species *E. americanum* Riley there is a striking resemblance. Prominent wax glands are lacking but these are sometimes also lacking in the spring forms of Eriosoma.

Characters.—Cornicles present and situated on shallow hairy cones as are those of Eriosoma. Stem mother with five-segmented antennæ; alate form with six-segmented antennæ which are armed with narrow sensoria that do not encircle the segment to any extent. Fore wings with the media once branched, hind wings with only one oblique vein. Cauda rounded. Prominent wax pores such as those present in Eriosoma lacking, but small wax areas present.

Forms living in pseudogalls on plants, the alate individuals migrating from the galls in the early spring.

Type (monotypical), *Georgia ulmi* Wlsn.

Genus GOBAISHIA Matsumura.

Plate X, A–G; XI, V.

1909. *Byrsocrypta* Tullgren, Arkiv för Zoologi, Bd. 5, no. 14, p. 182.
1917. *Gobaishia* Matsumura, Synopsis of the Pemphigidae of Japan, Gifu, Japan, p. 75.

Tullgren used the name Byrsocrypta Hal. as the name of a subgenus with *pallida* as type, placing it under Tetraneura. He apparently overlooked the fact that Westwood had set *bursarius* as the type of the genus Byrsocrypta as will be found discussed under the genus Pemphigus. *Pallida* is different from the species of Tetraneura, in that the cubitus is retained in the hind wing. If *Colopha* is retained on account of the branched nature of the media in the fore wings it will be necessary to place *pallida* as typical of a genus related to Tetraneura.

In 1917 Matsumura erected the genus Gobaishia with *Gobaishia japonica* Mats. as type. This species was stated to be very similar to *Tetraneura alba* Ratz. *Tetraneura alba* Ratz is the same species as *Eriosoma pallida* Haliday and the characters given for the genus are, therefore, similar to Tullgren's conception of Byrsocrypta. The figures drawn are from specimens of *pallida* as no *japonica* was available to the writer for study.

Characters.—Cornicles present, stem mother with four-segmented antennæ, alate forms with six-segmented antennæ which are armed with annular sensoria. Fore wings with the media usually simple; hind wings with both cubitus and media present.

Type (fixed by Matsumura, 1917), *Gobaishia japonica* Mats.

Genus TETRANEURA Hartig.

Plate X, H–M.

1841. *Tetraneura* Hartig, Germar's Zeitschrift für die Entomologie, v. 3, p. 366.

In 1841 Hartig erected the genus Tetraneura under which he gave *Tetraneura ulmi* Lin. ? questioned thus and described. He also listed *T. rugicornis* Hartig. One of these species was questioned and the other merely listed. *Ulmi* L., however, was questioned only in the sense of the determination, and a good description was given so that it is known what insect Hartig had.

In 1843 Kaltenbach gave a description of the genus Tetraneura crediting it to Hartig and described thereunder one species, *Aphis ulmi* De Geer. *Aphis ulmi* De Geer (1773) is the same species as *Aphis ulmi* Geoffroy (1764) but this name can not be used, since Linnaeus used *Aphis ulmi* for a different insect. This is the same insect described by Hartig as *T. ulmi* L.? and it is evident that it requires a new name, to which *ulmifoliae* is given.

Characters.—Cornicles very slightly elevated rings, not at all prominent. Stem mother with four-segmented antennæ; apterous form with five-segmented antennæ. Wax glands present. Alate form with six-segmented antennæ which are armed with narrow annular sensoria almost completely encircling the segment. Fore wings with the media simple; hind wings with only the media present.

Forms living in galls and migrating in spring to other plants. Sexes small, apterous and beakless. Oviparous female developing only one egg.

Type, *Tetraneura ulmifoliæ* Baker (*Aphis ulmi* L. of Hartig).

Tribe PEMPHIGINI.

The tribe Pemphigini is composed of forms which are highly specialized and most of which have developed the habit of true gall formation. The secretion of wax also occurs but wax secreting plates are not developed to the extent met with in some of the other tribes of the subfamily. Alternation of hosts is found to occur, migrants leaving the galls in early spring or summer and returning in autumn. In some species, however, the insects do not leave the galls until the mothers of the sexual forms are produced. Distinct cornicles are present and by this character forms in some of the other tribes which are suggestive of the Pemphigini may be distinguished. The typical host group is Populus and the galls are normally spring galls.

Characters.—Forms usually inhabiting true galls and often migrating to other plants during the summer. Antennæ of six segments in the alate form and in nearly all genera armed with linear, oval, or somewhat irregularly shaped sensoria. Small wax-secreting areas present. Sexual forms small, apterous, and beakless, the oviparous female developing only one egg.

Six genera may be included in the tribe and these genera may be separated by the following key:

KEY TO THE GENERA OF THE PEMPHIGINI.

1. Unguis of segment VI of alate form distinctly long and Aphis-like..Mordwilkoja.
   Unguis short and knob-like..... 2.
2. Media once branched..... 3.
   Media simple..... 4.
3. Antennæ of alate form usually without secondary sensoria. Wings flat in repose.....Phloeomyzus.
   Antennæ of alate form with secondary sensoria. Wings not flat in repose .....Pachypappella.
4. Both media and cubitus present in hind wing..... 5.
   One oblique vein only in hind wing .....Dryopeia.
5. Antennæ of alate form without secondary sensoria. Wings flat in repose .....Rhizoctonus.
   Antennæ of alate form with secondary sensoria. Wings not flat in repose... 6.
6. Antennæ of alate form rather short and thick. Stem mother with four-segmented antennæ.....Pemphigus.
   Antennæ of alate form rather long and slender. Stem mother with five-segmented antennæ.....Cornaphis.

Genus CORNAPHIS Gillette.

Plate X, N-T.

1913. *Cornaphis* Gillette, Ann. Ent. Soc. Am., v. 6, p. 491.

The genus Cornaphis was erected by Gillette for his species *Cornaphis populi*. In his description it is stated that the genus is closely related to Asiphum. In Cornaphis, however, there are large cornicles in the alate form and in other respects it seems that the genus is closely related to Pachypappella. In that genus, however, the media is once forked, whereas in Cornaphis it appears to be simple, at least as a rule. This difference has led the writer to retain a genus with *lactea* as type rather than to place that species and similar ones in Cornaphis.

Characters.—Cornicles present; stem mother with five-segmented antennæ and without wax plates. Alate form with six-segmented antennæ armed with rather narrow sensoria; permanent sensoria ciliate. Fore wings with the media simple, hind wings with both media and cubitus present; wax plates present in the apterous form; sexes small, apterous and beakless; the oviparous female developing only one egg.

Forms living in galls, the stem mother and the following forms living in the same gall.

Type (monotypical), *Cornaphis populi* Gill.

Genus DRYOPEIA Kirkaldy.

Plate X, U-Y.

1857. *Endeis* Koch, Die Pflanzenläuse Aphiden, p. 312.
1889. *Eudeis* Ashmead, Ent. Amer., v. 5, p. 189.
1904. *Dryopeia* Kirkaldy, The Entomologist, v. 37, p. 279.
1917. *Watabura* Matsumura, Synopsis of the Pemphigidae of Japan, p. 89.

In 1857 Koch erected his genus Endeis with two species, *bella* Koch and *rorea* Koch. This name was replaced by Dryopeia in 1904 by Kirkaldy, and *bella* has been definitely placed as the type.

In some respects the genus is suggestive of Anoecia, although it seems to be undoubtedly a Pemphiginid and will no doubt be so proven by the sexual forms.

In 1917 Matsumura erected his genus Watabura with *Watabura nishiyae* Mats. as type. This species was stated to resemble a Pemphigus, excepting that the antennal segments are somewhat different and only one oblique vein is in the hind wing. (Two obliques are shown in his Pl. XII, 9). The antennæ are armed with narrow transverse sensoria and there seems little doubt that this genus is a synonym of Dryopeia. It is noteworthy that the life history of the type species is not known, but it is thought to live on the roots of trees. The type of the genus Dryopeia is a root feeder.

Characters.—Cornicles present, situated on broad shallow cones, suggestive of those of Anoecia. Stem mother unknown, apterous forms with six-segmented antennæ. Alate forms with six-segmented antennæ, armed with narrow transverse sensoria. Fore wings with media simple, hind wings with one oblique vein. Summer forms subterranean, living on the roots of plants. Spring forms and sexes unknown. Apterous tarsi one-segmented.

Type (fixed by Kirkaldy, 1906), *Endeis bella* Koch.

Genus MORDWILKOJA Del Guercio.

Plate XI, A–G.

1909. *Mordwilkoja* Del Guercio, Rivista Patol. Veget., v. 4, p. 11.

This genus was erected in 1909 for the peculiar species *Byrsocrypta vagabunda* Walsh. This differs in the antennæ quite remarkably from all of the other species belonging to this tribe. The difference is in the long unguis of the sixth segment. However, the other characters and the four-segmented nature of the antennæ of the stem mother seem to place it with little doubt in the Pemphigini.

There has been some doubt cast by Oestlund on the determination of Walsh's species and this has led Cockerell to propose the name *oestlundi* for the species now known so well, but, as Gillette has pointed out, Walsh evidently accepted the insect of Riley and Monell as the same species as his *vagabunda*. The insects Riley had were undoubtedly the species we know and the writer therefore accepts *vagabunda* and the generic name Mordwilkoja. The genus was erected with the name *vagabunda* used as type and not *oestlundi*.

Characters.—Cornicles present as somewhat elevated rings. Stem mother with four-segmented antennæ, the unguis of segment VI slender and Aphis-like. Permanent sensoria ciliate. Alate form with five-segmented antennæ which are armed with narrow transverse sensoria. Fore wings with the media simple, hind wings with both media and cubitus present.

Forms living in galls; the stem mother and her offspring living in the same gall, the alate forms leaving the galls in spring or early summer. Sexes unknown, but no doubt small, apterous, and beakless.

Type (monotypical), *Byrsocrypta vagabunda* Walsh.

Genus PACHYPAPPELLA, n. n.

Plate XI, H-M.

1909. *Pachypappa* Tullgren, Arkiv för Zoologi, Bd. 5, no. 14, p. 69.

In 1854 the genus Pachypappa was erected by Koch with *marsupialis* and *vesicalis* in the genus. A study of *marsupialis* shows that this species is in reality a Pemphigus as it shows all the characters of this genus. Tullgren, 1909, noted this and therefore interpreted the genus differently. *Marsupialis* had, however, been set as the type of the genus. Pachypappa Koch, therefore, becomes a synonym of Pemphigus, and Pachypappa Tullgren must receive a new name for which Pachypappella is here given.

Characters.—Stem mother without cornicles but with wax plates; antennæ five-segmented. Alate form with cornicles; antennæ six-segmented and with transverse sensoria. Fore wings with media once branched, hind wings with both media and cubitus present.

Type (present designation), *Pachypappa lactea* Tullgren.

Genus PEMPHIGUS Hartig.

Plate XI, N-U.

1837. *Pemphigus* Hartig, Jahresb. u. d. Fortschr. d. Forstwiss. und forstl. Naturk., v. 1, p. 645.
1839. *Byrsocrypta* Haliday, Ann. Nat. Hist., v. 2, p. 190.
1840. *Brysocrypta* Westwood, Int. Mod. Class. Ins., Synopsis, v. 2, p. 118.
1847. *Aphioides* Rondani, Nuovi Annali Sci. Nat. Bologna (2), v. 8, p. 439.
1857. *Amycla* Koch, Die Pflanz. Aphiden, p. 301.
1857. *Pachypappa* Koch, Die Pflanz. Aphiden, p. 269.
1857. *Rhizomaria* Hartig, Verhandl. d. Hils-Solling-Forstvereins, Jahrg. 1856, p. 52.
1859. *Tychea* Koch, Die Pflanzenläuse Aphiden, p. 296.
1885. *Kessleria* Lichtenstein, Mon. Puceron du Peupl., p. 16.
1904. *Hamadryaphis* Kirkaldy, The Entomologist, v. 37, p. 279.

In 1837 Hartig erected his genus Pemphigus, although it was not until 1841 that his reference to the genus as generally cited appeared. Passerini in 1860 set *bursarius* as type. In 1839 Haliday used the generic term Byrsocrypta but mentioned no species. In 1840 Westwood referred to this genus as Brysocrypta and gave *bursaria* L. as type. In 1859 Koch erected the genus Tychea with *graminis* Koch as type (monotypical). Schouteden (1906) has described the winged form of *Tychea graminis* Koch and stated that it is a typical Byrsocrypta. The writer has had no opportunity to study specimens but on the strength of this statement of Schouteden places Tychea as a synonym of Pemphigus. It is worthy of note, however, that Schouteden did not mention the cornicles, and this is a point of considerable difference if *graminis* is a Pemphigus or if it belongs to the Fordini.

In 1857 Hartig described the genus Rhizomaria with *piceae* Hartig as type. This species, however, appears to be a typical Pemphigus and Rhizomaria will become a synonym.

In 1857 Koch erected the genus Amycla and of this genus *fuscifrons* Koch has been made the type. The writer has been unable to obtain specimens of this species but from the descriptions it seems almost

certain that this species is a true Pemphigus. This will thus make the genus Amycla a synonym.

In 1847 Rondani described the genus Aphioides of which *bursaria* Fab. was indicated as the type and Aphioides, therefore, is a synonym.

In 1854 Koch erected the genus Pachypappa of which *marsupialis* Koch has been made the type. *Marsupialis*, however, is a typical Pemphigus. Pachypappa Koch, therefore, must become a synonym. Tullgren (1909) used Pachypappa in a different sense, but this is discussed under the genus Pachypappella.

In 1886 Lichtenstein erected the genus Kessleria for *spirothica* and this name was replaced by Hamadryaphis Kirk. in 1904. A study of this species, however, shows that it is a typical Pemphigus. Therefore, these two names will become synonyms.

Characters.—Cornicles present; wax plates, if present, weakly developed; stem-mother with four-segmented antennæ; alate form with six-segmented antennæ which are armed with narrow, oval or somewhat irregular sensoria. Fore wings with the media simple; hind wings with both media and cubitus present. Sexes small, apterous, and beakless. Oviparous female developing only one egg.

Forms living in galls, the stem-mother and her offspring in the same gall, the alate forms typically leaving the galls in the spring.

Type (fixed by Passerini, 1860), *Aphis bursaria* L.

Genus PHLOEOMYZUS Horvath.

Plate XI, W–BB.

1886. *Löwia* Lichtenstein, Mon. Puceron Peupl., p. 37.
1896. *Phloeomyzus* Horvath, Wien. Ent. Zeit., v. 15, p. 5.

In 1886 Lichtenstein erected the genus Löwia with *Schizoneura passerinii* Sig. as type but as this name had been used previously it was replaced in 1896 by Phloeomyzus Horvath.

It is with some hesitation that the writer places this genus in the Pemphigini. In some respects it suggests the Melaphini, while in many respects it strongly suggests the Thelaxini or even the Phyllaphidina. Indeed, to the Melaphini it shows striking resemblances. Without a study of the sexual forms it will be very difficult to place the genus definitely. All that can be done at the present time is to place it tentatively with the forms with which it appears to be related, and if further study shows this to be incorrect the genus can be placed definitely with its allies.

Characters.—Cornicles present, very slightly elevated. Apterous form with six-segmented antennæ. Alate form with six-segmented antennæ which are rather slender and without secondary sensoria. Fore wings with the media once branched, hind wings with both media and cubitus present. Large wax plates present on the abdomen. Wings held flat in repose.

Forms living free upon the bark of trees in colonies.

Type (monotypical), *Schizoneura passerinii* Sig.

Study based on specimens received from Mordwilko from Warsaw, Poland, and notes by Pergande on type specimens loaned by Horvath.

Genus RHIZOCTONUS Mokrzecky.

1895. *Rhizoctonus* Mokrzecky, Horae. Soc. Ent. Ross., v. 30, p. 438.

The genus Rhizoctonus was erected for *ampelinus* Mok., a species occurring on the vine. Through the kindness of H. F. Wilson the writer has been able to examine a slide containing alate forms. These, however, are in a very poor condition and it is impossible to determine whether or not cornicles are present. The antennæ too are much distorted. This slide seems to indicate, however, that *ampelinus* is somewhat related to *passerinii* Sig., an hypothesis which is strengthened by the fact that both species hold the wings flat in repose. The genus, therefore, is placed here with some hesitation.

Characters.—Antennæ of six segments, without secondary sensoria and rather thick. Fore wings with the media simple. Hind wings with both media and cubitus present. Wings held flat in repose. Cauda and anal plate rounded.

Type (monotypical), *Rhizoctonus ampelinus* Mok.

Tribe MELAPHINI.

The tribe Melaphini is suggestive both of the Pemphigini and of the Eriosomatini. It is, however, quite distinct from both. The habits more nearly resemble those of the Pemphigini. The tribe is placed here but a study of the sexes may show that it really belongs to the Hormaphidinae. The typical host group is Rhus, and the galls are typically fall galls.

Characters.—Gall-inhabiting forms. Cornicles absent; antennæ of the alate form of five or six segments armed with somewhat oval or linear transverse sensoria. Sexual forms not known.

The genera may be separated as follows:

Key to the Genera of the Melaphini.

1. Both media and cubitus present in the hind wings ..... 2.
   Only the media present in the hind wings ..... Aploneura.
2. Stigma of four wings pointed on distal portion and extending some distance ..... Melaphis.
   Stigma stopping abruptly on distal extremity ..... 3.
3. Antennæ of five segments ..... Nurudea.
   Antennæ of six segments ..... Pemphigella.

Genus APLONEURA.

Plate XII, A–E.

1863. *Aploneura* Passerini, Aphididae Italicae, p. 78.
1869. *Tetrenema* Derbès, Ann. des Sc. Nat. Zool. (5), v. 11, p. 106.
1848. *Baizongia* Rondani, Nuovi Annali delle Scienze Naturali, v. 9, p. 35.

The genus is distinguished quite easily from related ones by the venation of the hind wings, the relation of the cubitus and anal of the fore wings, and by the structure of the antennæ. The positive determination of the insect of Fabricius may cause Aploneura to fall for Rondani's name.

Characters.—Cornicles absent. Stem-mother with five-segmented antennæ; alate form with the media simple, the cubitus and anal joined near their bases. Hind wings with only the media present, antennæ of six segments, armed with large subcircular or elongate sensoria. Forms living in true galls.

Type (monotypical), *Tetraneura lentici* Pass.

Genus MELAPHIS Walsh.

Plate XII, F-K.

1866. *Melaphis* Walsh, Proc. Ent. Soc. Phila., v. 6, p. 281.
1883. *Schlechtendalia* Lichtenstein, Stett. Ent. Zeit., v. 44, p. 240.
1905. *Abamalekia* Del Guercio, Redia, v. 3, p. 364.

Walsh erected his genus for *rhois* Fitch, a species forming galls on sumach and in his discussion mentioned the Chinese gall, wondering if it could be congeneric. The writer has recently published an account of the Chinese gall[1] and therein placed Schlechtendalia Licht. as a synonym of Melaphis. Del Guercio's genus was erected with his *lazarewi* as type and placed as a thelaxine. Although the writer has never obtained specimens of this species he is of the opinion that it can not possibly be one of these insects and that it evidently belongs in the Melaphini where the shape of the stigma would immediately place it as a Melaphis.

Characters.—Cornicles absent. Apterous form with five-segmented antennæ. Alate form with either five or six segmented antennæ which are armed with somewhat linear or oval sensoria. Fore wings with the media simple, although sometimes slightly forked, distal extremity of the stigma rather long drawn out; hind wings with both media and cubitus present; abdomen with distinct wax plates. Forms living in galls from which the alate forms escape in late summer or fall.

Type (monotypical), *Byrsocrypta rhois* Fitch.

Genus NURUDEA Matsumura.

Plate XII, L-Q.

1917. *Nurudea* Matsumura, Synopsis of the Pemphigidae of Japan, p. 65.
1917. *Nurudeopsis* Matsumura, Synopsis of the Pemphigidae of Japan, p. 67.
1917. *Fushia* Matsumura, Synopsis of the Pemphigidae of Japan, p. 70.

Matsumura erected his genus Nurudea for his *Nurudea ibofushi*, a species somewhat similar to a species of Melaphis. This species differs quite markedly, however, in the form of the stigma. At the same time he erected the genus Nurudeopsis with *N. shiraii* as type. This species differs little from *ibofushi* excepting in the proportions of the segments, and in the fact that the cubitus and first anal are somewhat closer together at the base. The writer is of the opinion that these characters are not sufficient on which to form another genus. In the same work also he erected the genus Fushia with *Fushia rosea* Mats. as type. This species differs somewhat from the type of Nurudea but the writer believes that there are not differences sufficient to cause this to be considered as a separate genus. The antennæ

[1] Baker, A. C. On the Chinese gall (Aphididae—Hom.). *In* Ent. News, v. 28, p. 385–393, 1917.

are more slender and of somewhat different proportions and the cubitus and anal of the fore wings are united somewhat at base. In other genera, however, this difference between species is to be found, and it seems wisest not to adopt it in this group as of generic importance.

Characters.—Cornicles absent. Antennæ of five segments armed with linear or somewhat oval sensoria. Fore wings with the media simple, the stigma normal; hind wings with both media and cubitus present. Sexes unknown. Forms making galls upon the leaves of plants.

Type (fixed by Matsumura, 1917), *Nurudea ibofushi* Mats.

Genus PEMPHIGELLA Tullgren.

1909. *Pemphigella* Tullgren, Arkiv för Zool., v. 5, p. 171.
1918. *Dasia* Van der Goot, Mem. Ind. Mus., v. 6, p. 152.

Characters.—Cornicles absent. Antennæ of six segments armed with oval sensoria. Hind wings with both media and cubitus present. Sexes unknown. Species forming galls on plants. Type (monotypical), *Tetraneura cornicularia* Pass.

Tribe PROCIPHILINI.

The tribe Prociphilini contains forms which specialized in some directions more than did the Eriosomatini. In other ways, however, they appear to be more primitive than certain genera of that tribe. The cornicles have here disappeared altogether and large wax areas have replaced them. In their habits of gall formation, however, the Eriosomatini are more advanced than are members of the present tribe.

Characters.—Forms living in crumpled or twisted leaves or in a somewhat complete gall caused by the rolling up of the leaves of the host. Wax plates present; cornicles absent; antennæ of stem mother of five segments; those of the alate form six segmented and armed with narrow, transverse, or somewhat broadly oval sensoria.

Key to the Genera of the Prociphilini.

1. Media once forked, stem mother usually without wax plates ..... Asiphum.
   Media simple, stem mother with several rows of wax plates ..... 2.
2. Wax plates large, those on the thorax well developed, stem mother and offspring living together ..... 3.
   Wax plates not well developed, stem mother usually in a gall by herself .. Thecabius.
3. Sensoria narrow, linear, ciliate ..... Prociphilus.
   Sensoria somewhat oval, nonciliate ..... Neoprociphilus.

Genus ASIPHUM Koch.

Plate XII, R–X.

1857. *Asiphum* Koch, Die Pflanzenläuse Aphiden, p. 246.
1859. Type fixation, Gerstaecker, Bericht for 1857, p. 249.
1905. Type fixation, Kirkaldy, Can. Ent., v. 37, p. 418.

The genus Asiphum was erected by Koch with two species, *populi* Fab. and *ligustrinellum* Koch. He listed De Geer's work in the literature under *populi* Fab. The *populi* of Fabricius proves to be the *tremulae* of De Geer. Only the species *ligustrinellum* was placed

in the genus by Lichtenstein (1885) and this species has been indicated as type of the genus by Kirkaldy (1905). *Tremulae* De Geer is a well-known species but the writer has been unable to obtain *ligustrinellum* and, in fact, has been unable to learn anything definite in regard to the species. The following conception of the genus, therefore, is based upon *tremulae* De Geer in view of the fact that *ligustrinellum* appears to be unknown, and since *Aphis populi* Fab. was indicated by Gerstaecker in 1859.

Characters.—Cornicles absent; wax plates present in the alate forms; stem mother with five-segmented antennæ. Alate form with six-segmented antennæ which are armed with rather narrow transverse sensoria. Fore wings with the media once forked, hind wings with both media and cubitus present. Forms living in the somewhat crumpled leaves of their host.

Type (fixed by Gerstaecker, 1859), *Aphis populi* Fab.

Genus NEOPROCIPHILUS Patch.

Plate XIII, A–F.

1912. *Neoprociphilus* Patch, Bul. Me. Agr. Expt. Sta., no. 202, p. 174.

The genus Neoprociphilus Patch is very close indeed to Prociphilus, the characters which separate it being the somewhat more oval or rounded sensoria and the fact that the sensoria are not ciliate. However, in some of the species of *Prociphilus*, particularly in the fall forms, somewhat oval sensoria are met with. It is retained doubtfully.

Characters.—Stem mother with five-segmented antennæ. Cornicles absent, large wax plates similar to those of Prociphilus present. Alate form with six-segmented antennæ which are armed with oval or subcircular nonciliate sensoria. Fore wings with the media simple, hind wings with both media and cubitus present. Sexes small, apterous, and beakless. Oviparous female developing only one egg.

Forms living free upon their host, the stem mother and following generations in company.

Type (monotypical), *Pemphigus attenuatus* O. S.

Genus PROCIPHILUS Koch.

Plate XIII, G–N.

1857. *Prociphilus* Koch, Die Pflanzenläuse, p. 279.
1857. *Stagonia* Koch, Die Pflanzenläuse, p. 284.
1875. *Holzneria* Lichtenstein, Bul. Soc. Ent. Fr. (5) v. 5, p. LXXVI.
1917. *Nishiyana* Matsumura, Synopsis of the Pemphigidae of Japan, p. 90.

In 1857 Koch erected his genus Prociphilus with three species: *bumeliae* Schrank, *erraticus* Koch, and *gnaphalii* Kalt. Later in the work (p. 284) he used *xylostei* De Geer as the type of the genus Stagonia. This species, *xylostei*, is in all respects similar to *bumeliae* and therefore Stagonia becomes a synonym of Prociphilus. In 1875 Lichtenstein erected the genus Holzneria with *poschingeri* Holzner as type. *Poschingeri* has been considered by many authors as the alternate form of *bumeliae*. In such case Holzneria must necessarily

be a synonym of Prociphilus. Should *poschingeri*, however, be proven to be a distinct species it is so similar in all regards that Holzneria must remain a synonym.

In 1917 Matsumura erected the genus Nishiyana with *N. aomoriensis* Mats. as type, placing it close to Prociphilus. From this genus he separated it because of the absence of wax plates in the thorax and the somewhat shorter antennæ. It must be borne in mind, however, that the specimens he had were fall migrants. Fall migrants of several species of Prociphilus show very reduced wax plates, and in some these are absent altogether, although distinct in the spring migrants. It is believed that this genus is in reality Prociphilus.

Characters.—Cornicles absent, wax plates present, very large and well developed. Stem mother with five-segmented antennæ. Alate form with six-segmented antennæ armed with narrow transverse sensoria; secondary sensoria fringed. Fore wings with the media simple, hind wings with both media and cubitus present. Sexes small, apterous, and beakless. Oviparous females developing only one egg. Forms living in pseudogalls, the stem mother and her offspring together.

Type (fixed by Gerstaecker, 1859), *Aphis bumeliae* Schr.

Genus THECABIUS Koch.

Plate XIII, O-U.

1857. *Thecabius* Koch, Die Pflanzenläuse, p. 294.
1886. *Bucktonia* Lichtenstein, Monogr. d. pucerons, p. 16.

The genus Thecabius was erected by Koch in 1857 for his species *populneus*. This species proves to be a synonym of *Pemphigus affinis* Kalt. In 1886 Lichtenstein erected the genus Bucktonia with *affinis* Kalt. as type. Bucktonia, therefore, becomes a synonym.

Characters.—Cornicles absent; wax plates present but not prominently developed as in Prociphilus. Stem mother with five-segmented antennæ and rather narrow sensoria, secondary sensoria not fringed; fore wings with media simple, hind wings with both media and cubitus present. Sexual forms small, apterous, and beakless, oviparous female developing only one egg.

Forms living in galls, the stem mother usually living in a gall by herself.

Type (monotypical), *Thecabius populneus* Koch (=*Pemphigus affinis* Kalt.)

This genus is closely related to Prociphilus and it is with some hesitation that the writer places it as distinct. Certain species, such as *patchii* Gillette, which are undoubtedly congeneric with *affinis*, do not show the typical life habit of the stem mother living in a gall alone. However, the character of the sensoria and the undeveloped nature of the wax glands may serve to distinguish the genus.

Tribe FORDINI.

Members of the Fordini are specialized subterranean forms mostly living in the nests of ants. The aphids excrete honeydew, in return for which they are tended carefully by these insects. The apterous

forms generally are of a yellowish or brownish-yellow color, sometimes a milk white. Wax-secreting plates are present but they are not developed to the same extent as are those of the Prociphilini. The cornicles are lost entirely and the region where these usually occur is occupied by wax plates. In some species the wax areas are reduced. Some species are armed with fine hairs, whereas others are almost entirely smooth. The eyes in the apterous forms are composed of three facets. The alate forms have rather short, thick antennæ with somewhat oval sensoria. Three genera compose the tribe and these may be separated as follows:

KEY TO THE GENERA OF THE FORDINI.

1. Antennæ of the alate form composed of five segments.....Forda.
   Antennæ of the alate form composed of six segments..... 2.
2. Sensoria of the antennæ of the alate form small and scattered over most of the segment, a central triangular wax plate on the thorax; apterous form with six-segmented antennæ.....Paracletus.
   Sensoria of the antennæ of the alate form larger and more evenly placed; the sensoria sometimes extending evenly across the segment. Apterous form with five-segmented antennæ, sometimes with six segments present.....Geoica.

Genus FORDA Heyden

Plate XIII, V-AA.

1837. *Forda* Heyden, Mus. Sinkbg., v. 2, p. 291.
1841. *Rhizoterus* Hartig. Zeit. Ent., v. 3, p. 363.
1849. *Smynthurodes* Westwood, Gardener's Chron., p. 420.
1896. *Pentaphis* Horvath, Wien. Ent. Zeit., v. 15, p. 2.
1909. *Pentaphis* Del Guercio, Rivist. Patol. Vegetale, n. s., v. 3, p. 332.
1914. *Rectinasus* Theobald, The Entomologist, v. 47, p. 28.

In 1837 Heyden erected his genus Forda, the type of which is *formicaria* Heyden. In 1896 Horvath erected his genus Pentaphis with *marginata* Koch as a type, while Del Guercio in 1909 used *trivialis* Pass. as the type of a genus of the same name. Specimens of *marginata* Koch from Horvath prove that this species in every respect is similar to the type of the genus. Pentaphis, therefore, will become a synonym of Forda. Likewise specimens of *trivialis* show that this species belongs in the same genus. In 1841 Hartig erected the genus Rhizoterus, the type of which is *vacca*. According to Lichtenstein this species is a synonym of *formicaria* Heyden, and Rhizoterus also, then, becomes a synonym.

In 1914 Theobald erected his genus Rectinasus with his *buxtoni* as type. He based his genus on the proportions of the antennal segments, their length, and the length of the beak. The writer is opposed to basing genera on the proportions of the antennal segments, for in species in which these are of different proportions a very close relationship is evident. This is also true of the beak. Many American species taken in ants' nests and as yet undescribed have beaks ranging from small to longer than the body, but they are all evidently

closely related. The other characters mentioned by Theobald are seen to be present in the type species. The tubercles he figures and describes are the same and the spines on the first and second antennal segments are evidently the thickened, pointed, chitinized articulations of the segments common in insects of this type. We believe, therefore, that Rectinasus should be carried as a synonym of *Forda*. Westwood's genus was erected on his *betae* which appears to belong here as recently indicated by the writer.

Characters.—Cornicles wanting; apterous forms with five-segmented antennæ and eyes of three facets. Alate form with five-segmented antennæ and medium-sized oval, or more or less irregularly shaped sensoria. Fore wings with media simple; hind wings with both media and cubitus present, arising slightly apart. Subterranean forms living usually in the nests of ants and tended by them.

Type (monotypical), *Forda formicaria* Heyden.

Genus GEOICA Hart.

Plate XIV, A–K.

1894. *Geoica* Hart, 18th Rept. State Ent. Ill., p. 101.
1860. *Tychea* Passerini, Gli Afidi, p. 30.
1906. *Tycheoides* Schouteden, Mem. Soc. Ent. Belg., v. 12, p. 194.
1906. *Kaltenbachiella* Schouteden, Mem. Soc. Ent. Belg., v. 12, p. 194.
1909. *Trifidaphis* Del Guercio, Rivista Patol. Vegetale, n. s., v. 3, p. 332.
1912. *Tullgrenia* V. d. Goot, Tijdschr. voor Ent., v. 15, p. 96.
1913. *Trinacriella* Del Guercio, Redia, v. 9, p. 169.
1916. *Serrataphis* V. d. Goot, Zur Kenntniss der Blattläuse Java's, p. 263.

In 1860 Passerini used the generic name Tychea of Koch and placed as the typical species *phaseoli* Pass. In 1863 he used the name again, listing several species but not the species included by Koch. Therefore his interpretation of the genus can not be correct. In 1894 Hart erected his genus Geoica with *squamosa* as type. In 1906 Schouteden noticed Passerini's mistake and suggested the name Tycheoides but made *eragrostidis* Pass. the type. In the same year he erected Kaltenbachiella with *menthae* Schout. as type. In the year 1909 Del Guercio erected Trifidaphis with *radicicola* Essig as type. In 1912 Van der Goot noted Passerini's mistake and proposed the name Tullgrenia for the Tychea of Passerini. In 1916 Van der Goot erected the genus Serrataphis with *lucifuga* Zehntner as type.

In studying cotypes and other specimens of *squamosa* certain generic characters are evident. The species is subterranean. It has five-segmented antennæ in the apterous form and six-segmented ones in the alate. It is true, however, that the apterous form sometimes has only four segments in the antennæ and the alate five. Indeed, in some alate forms there is a five-segmented antenna on one side and a six-segmented one on the other. One of these five-segmented antennæ was figured by Hart. One wing vein only was figured in the hind wing by Hart, but a very close examination shows that both the media and cubitus, though faint, are present. These are very difficult to trace in balsam mounts. In giving his name

Tycheoides Schouteden makes plain that he is naming the Tychea of Passerini and yet he sets a different type. He further states: "Le genre *Tychea* est vraisemblablement destiné à desparaître, ses espèces appartenant en réalité à *Tetraneura* ou *Byrsocrypta*." He evidently is speaking here of the Tychea of Koch, since specimens of *Tychea* Pass. do not possess the cornicles of either of the two genera mentioned.

In describing Kaltenbachiella Schouteden gives as a character the four-segmented antennæ, etc., of the apterous form. The alate form he did not know, but from his description of the pupa it evidently would possess six-segmented antennæ. There seems little doubt that this is another such case as *squamosa* where the apterous form has often four-segmented antennæ, although five is the normal number, the alate form normally having six. Hart's description has led Schouteden astray and he places Geoica close to Forda, separating it therefrom by the venation of the hind wing. Considering all of these facts there seems little doubt that Kaltenbachiella should be placed as a synonym of Geoica.

Specimens of *phaseoli* show very similar characters in every respect. It is true that the antennæ are somewhat longer and the hairs simple, but in every respect of importance the insects agree. The apterous form has five-segmented antennæ and the alate form has six-segmented ones with the sensoria very similar in nature. The cauda also is very similar. It is evident then that Tychea Pass. and Tullgrenia V. d. Goot become synonyms of Geoica Hart. Specimens of *lucifuga* Zehntner show a remarkable resemblance to *squamosa* with the exception, of course, of the squamæ. The apterous form has five-segmented and the alate form six-segmented antennæ. In general form and structure of the caudal extremity the insects are the same and, therefore, Serrataphis V. d. Goot will become a synonym of Geoica. There remains, then, to discuss the genus Trifidaphis Del Guercio. The cotypes of the type species show a close resemblance to the general type of *squamosa*. The apterous forms have five-segmented antennæ and in the alate form, as in *squamosa*, some forms have five segments and some forms have six. The general resemblance in other respects seems to prove that Trifidaphis is a synonym of Geoica.

It should be pointed out that the sexes described by Hart are in all probability not sexual forms, but immature specimens.

In 1913 Del Guercio erected the genus Trinacriella for his new species *magnifica*. He gave a brief description stating that the apterous forms had five-segmented antennæ and the alate forms six. No specimens of this species are available to the writer, but there seems little doubt that Trinacriella will become a synonym of Geoica.

Characters.—Cornicles wanting; apterous form usually with five-segmented antennæ and eyes of three facets. With the intermediate forms more facets may occur. Alate form with usually six-segmented antennæ and rather large oval sensoria with distinct rims. Fore wings with media simple. Hind wings with both media and cubitus present, though these may be faint and almost obscured in balsam. Cauda large and somewhat rectangular or rounded. Subterranean forms living on the roots of plants. Sexes small, apterous, and beakless.

Type (monotypical), *Geoica squamosa* Hart.

Genus PARACLETUS Heyden.

Plate XIV, L–S.

1837. *Paracletus* Heyden, Mus. Sinkbg., v. 2, p. 295.

The genus Paracletus is closely related to Forda Heyden from which it may be distinguished by the number of antennal segments in both alate and apterous forms. As with other genera of this tribe the eyes of the apterous form consist of three facets. Intermediate forms often occur, however, in which the intermediate nature is indicated only by the eyes which have the beginnings of compound eyes, such as are found in the alate form. There never are, however, complete compound eyes. The genus was erected by Heyden in 1837. The species live in close association with ants.

Characters.—Cornicles absent. Apterous form with six-segmented antennæ and eyes of three facets; alate form with six-segmented antennæ which possess many rather small, oval sensoria. Fore wings with media simple, hind wings with both media and cubitus present, arising some distance apart. Thorax with a central wax plate. Forms living in the nest of ants and cared for by them. Sexes small, apterous, and beakless. In some cases only one claw is met with on the foot, while in other cases the normal number of two is present. This appears to be no definite character, as sometimes a claw is dropped from one foot and sometimes from another.

Type (monotypical), *Paracletus cimiciformis* Heyden.

Subfamily IV, HORMAPHIDINAE.

The genera placed in this subfamily have usually been placed with the Eriosomatinae, or Pemphiginae, as it has been sometimes called. Mordwilko, however, placed these forms as his third tribe under the subfamily Aphidinae next to his tribe Callipterea. Something can be said in favor of both of these placings. In the first instance, the species in general form, antennal structure, and habit of gall formation are no doubt suggestive of the Eriosomatinae. On the other hand, their structure in regard to cauda and anal plate is very like the Callipterina and the sexual forms appear to have a development of their own, although they are nearer in many ways to the Aphidinae than to the Eriosomatinae.

It is the author's belief that these forms should constitute a separate subfamily. It has developed the habit of gall formation and the sensory characters which usually accompany it, while at the same time it has retained in the sexual female the normal develop-

ment of the ovaries found in the more primitive groups, and has retained in both sexual forms the beak and the ability to feed. This at once suggests a different line of development from that taken by the Eriosomatinae, although in some of its habits the Hormaphidinae agrees with that subfamily. In other lines, however, marked differences are met with here and one of the most striking of these is development of aleyrodiform generations, which remain stationary upon the host. Such a development is never met with in the Eriosomatinae, although the sexual forms are much more specialized.

Since many of the genera of the Hormaphidinae are gall formers, sensoria very similar to those met with in the Eriosomatinae are met with here also. Indeed the same annular sensoria found in the Eriosomatini are even more pronounced in the Hormaphidinae and the sensoria on the wing bases are prominent and often, numerous.

The cornicles in the present subfamily are sometimes absent or, as is usually the case, reduced to mere rings. In some genera, however, they may be elevated slightly on broad shallow cones, somewhat suggestive of those of Anoecia. No prominent cornicles, however, occur.

In the wing venation there is often a considerable reduction and this shows also the specialized nature of the insects. The venation is comparable to that met with in the Eriosomatinae. In the fore wings the media is either simple or once branched, the radial sector, cubitus, and anal are present, but the cubitus and anal are often fused near their bases. In the hind wings both the media and cubitus are sometimes present, but often only the media remains.

Great specialization in wax-producing organs occurs. In many of the forms these agree with the ones found in the Pemphigini. In certain aleyrodiform generations and in some sexual forms agglomerate glands or rather groups of small glands are seen. These may be arranged in different ways and often are placed about the margin of the insect so that it possesses a distinct lateral fringe, very like that of an aleyrodid. In fact some of these insects on this account are very often mistaken for aleyrodids.

The sexual forms are often quite small and possess large wax-producing areas. Others may lack these. All, however, develop to normal adults.

The habit of gall formation is very marked here. Indeed, some species form galls on two different species of plants, migrating between the two.

Characters.—Aerial forms living in galls or sometimes free upon the host. The mesothorax in many forms altered so that its divisions are more or less unobservable, the entire mesothorax often showing as only one plate. Scalelike or aleyrodiform

generations often developed. Cornicles often reduced to mere ringlike openings or entirely absent. Sexual forms small and apterous but with fully developed beaks. Oviparous female laying several eggs.

KEY TO THE TRIBES OF THE HORMAPHIDINAE.

1. Aleyrodiform generations developed ..... 2.
   Aleyrodiform generations not developed ..... OREGMINI.
2. Cornicles absent; insects usually gall formers ..... HORMAPHIDINI.
   Cornicles usually present; insects usually not gall formers ..... CERATAPHIDINI.

Tribe HORMAPHIDINI.

Members of this tribe are distinguished easily from those of other tribes in that the cornicles are absent and aleyrodiform generations are developed. These remain more or less quiescent upon the foliage. Some different forms of the species are often gall producers. All secrete wax from special pores. Considerable variation is met with in the development of the aleyrodiform generations. Sensoria of the alate forms are usually narrow and annular.

Only two genera are so far recorded.

KEY TO THE GENERA OF THE HORMAPHIDINI.

Antennæ of the alate forms composed of three segments, hind wings with only the media present ..... Hormaphis.
Antennæ of the alate forms composed of five segments, hind wings with both media and cubitus present ..... Hamamelistes.

Genus HAMAMELISTES Shimer.

Plate XIV, T-X.

1867. *Hamamelistes* Shimer, Trans. Am. Ent. Soc., v. 1, p. 284.
1896. *Tetraphis* Horvath, Wien. Ent. Zeit., v. 15, p. 6.

Shimer included two species in this genus, *spinosus* Shimer and *cornu* Shimer. The latter species, as suspected by him, is a synonym of *hamamelidis* Fitch. This species has been made the type of Hormaphis.

Characters.—Cornicles absent. Stem mother with four-segmented antennæ. Aleyrodiform generations developed. Alate form with five-segmented antennæ which are armed with numerous annular sensoria. Wings held flat in repose; fore wings with the media simple; hind wings with both media and cubitus usually present; cauda knobbed, anal plate bilobed; wax-secreting areas abundantly present in the apterous forms. Sexes small and apterous but with beaks developed, oviparous female laying several eggs.

Forms living in galls upon the leaves or scale-like on the leaves or twigs.

Type (one unquestioned species), *Hamamelistes spinosus* Shimer.

Genus HORMAPHIS Osten-Sacken.

Plate XIV, Y-FF.

1861. *Hormaphis* Osten-Sacken, Stettiner Ent. Zeit., p. 422.

The genus Hormaphis was erected by Osten Sacken for a species he described as *hamamelidis*. This species it later proved was the same described by Fitch as *Byrsocrypta hamamelidis*. The genus later was made to include *spinosus* Shimer, but the distinction between this genus and the one described by Shimer has been pointed out by Pergande.[1]

Characters.—Cornicles absent; aleyrodiform generations developed; wax glands very numerous; stem mother with three-segmented antennæ; alate forms with three-segmented antennæ which are armed with distinct annular sensoria. Wings held flat in repose; fore wings with the media simple; hind wings with the cubitus absent. Sexual forms small and apterous, possessing beaks, oviparous female laying several eggs.

Type (monotypical), *Hormaphis hamamelidis* O. S. (*Byrsocrypta hamamelidis* Fitch).

Tribe OREGMINI.

Characters.—Forms living in galls or otherwise upon the leaves of plants, possessing cornicles and wax secreting glands. Antennæ of the winged forms usually armed with annular sensoria; cauda rounded or somewhat knobbed, anal plate somewhat bilobed. No aleyrodiform generations developed. The sexual forms appear to be unknown.

KEY TO THE GENERA OF THE OREGMINI.

1.	Vertex with two horn-like projections	2.
	Vertex without such horn-like projections	3.
2.	Antennæ five-segmented	Oregma.
	Antennæ four-segmented	Ceratoglyphina.
3.	Antennæ of apterous form with five segments	4.
	Antennæ of apterous form with four segments	Glyphinaphis.
4.	Media of fore wings once branched	Astegopteryx.
	Media of fore wings simple	Mansakia.

Genus ASTEGOPTERYX Karsch.

Plate XV, Q-X.

1890. *Astegopteryx* Karsch, Ber. deutsch Botan. Ges., v. 8, p. 52.
1906. *Nipponaphis* Pergande, Ent. News, v. 17, p. 205.
1916. *Schizoneuraphis* Van der Goot, Zur Kenntniss der Blattläuse Java's, p. 245.

The genus Astegopteryx was erected with *styracophila* Karsch as type. Another species, *nekoashi*, was described by Sasaki before the International Congress at Brussels in 1911 and a third species, *styraci*, was described by Matsumura in 1917. It is possible, therefore, to gain a fair conception of the characters. In 1906 Pergande erected his genus Nipponaphis with *distychii* Perg. as type. This species was stated to be from *Distychium racemosum* in Japan, on

[1] Pergande, T. The life history of two species of plant lice inhabiting both the witch-hazel and birch. U. S. Dept. Agr. Bur. Ent. Tech. Ser. no. 9. 1901.

which it forms galls. In 1916 Van der Goot erected his Schizoneuraphis with *gallorum* V. d. Goot as type. This species was said to form galls on *Distylium stellare*.

The genus Astegopteryx can be separated as far as the recognized forms are concerned by the proportion of the antennal segments and some variation in the shape of the stigma. These differences are not, however, of large importance and Nipponaphis should be a synonym of Astegopteryx. In the same way, the type of Van der Goot's genus is not sufficiently different to warrant the erection of a new genus and Schizoneuraphis also should be considered a synonym.

Characters.—Cornicles broad rings; apterous form with five-segmented antennæ; alate form with five-segmented antennæ which are armed with annular sensoria. fore wings with the media once branched; hind wings with both media and cubitus present. Stigmal vein arising rather far back on the stigma. Cauda rounded, anal plate somewhat bilobed; forms living in galls.

Sexual forms unknown.

Type (monotypical), *Astegopteryx styracophila* Karsch.

Genus CERATOGLYPHINA Van der Goot.

Plate XV, M–P.

1916. *Ceratoglyphina* Van der Goot, Zur Kenntniss der Blattläuse Java's, p. 237.

Characters.—Cornicles present as mere pores. Vertex with two hornlike projections. Antennæ of four segments; cauda and anal plate both rounded. Winged orms unknown.

Type (fixed by V. d. Goot, 1916), *Ceratoglyphina bambusae* V. d. Goot.

Genus GLYPHINAPHIS Van der Goot.

Plate XV, H–K.

1916. *Glyphinaphis* Van der Goot, Zur Kenntniss der Blattläuse Java's, p. 232.

Characters.—Cornicles present as mere pores; antennæ of four segments which are armed with linear sensoria. Fore wings with the media once branched; hind wings with both media and cubitus present; cauda knobbed; anal plate rounded; body covered with stout hairs.

Type (fixed by V. d. Goot, 1916), *Glyphinaphis bambusae* V. d. Goot.

Genus MANSAKIA Matsumura.

Plate XV, L.

1917. *Mansakia* Matsumura, Synopsis of the Pemphigidae of Japan, p. 59.

The author of the genus Mansakia stated that it is closely allied to Hormaphis, but it would appear to the writer to be related to the genera in the Oregmini as understood in the present classification. The presence of the cornicles would indicate that the genus is not related as closely to Hormaphis as to Astegopteryx, but its host and the nature of the gall would place it close to Hamamelistes. Since all of the forms are not known it is impossible to state positively its position.

Characters.—Cornicles present as mere rings. Antennæ of five segments armed with annular sensoria. Fore wings with the media simple, hind wings with two oblique veins. Cauda rounded, anal plate somewhat bilobed. Sexes not known.

Forms causing galls upon plants, the galls usually armed with numerous long projections.

Type (fixed by Matsumura, 1917), *Mansakia miyabei* Mats.

Genus OREGMA Buckton.

Plate XV, A-G.

1893. *Oregma* Buckton, Ind. Mus. Notes, v. 3, p. 87.
1897. *Ceratovacuna* Zehntner, Mededl. Proefs. Java, n. s., no. 37, p. 29.

In 1893 Buckton established his genus Oregma with *bambusae* Buckton as type, while in 1897 Zehntner established his Ceratovacuna with *lanigera* Zehntner as type. Specimens of both of these species sent by Zehntner and specimens of *bambusae* from Green taken in Ceylon show that these genera must be considered the same.

Characters.—Both alate and apterous forms with two hornlike projections on the vertex, wax gland areas present; antennæ five-segmented, those of the alate form with narrow annular sensoria; cauda rounded or somewhat knobbed; fore wings with media twice forked, hind wings with both media and cubitus present; cornicles broad, slightly elevated rings.

Type (monotypical), *Oregma bambusae* Buckt.

Tribe CERATAPHIDINI.

This tribe is closely related to the Hormaphidini but differs in that very distinct cornicles are here present. The apterous forms are scalelike and quiescent and feed upon the surfaces of the leaves. The alate forms possess annular sensoria. Wax secretion is abundant.

The genera may be separated as follows:

KEY TO THE GENERA OF THE CERATAPHIDINI.

Antennæ of the aleyrodiform generations of five segments ..... Aleurodaphis.
Antennæ of the aleyrodiform generations of four segments ..... Cerataphis.
Antennæ of aleyrodiform generations of three segments ..... Thoracaphis.

Genus ALEURODAPHIS Van der Goot.

Plate XVI, A-E.

1916. *Aleurodaphis* Van der Goot, Zur Kenntniss der Blattläuse Java's, p. 239.

This genus was erected for one species occurring in Java.

Characters.—Form flat, aleyrodiform, three distinct divisions evident; cornicles present as mere rings. Margin with wax secreting glands; dorsum also with many small glands. Cauda rather elongate and knobbed, anal plate bilobed. Antennæ five-segmented; eyes of the apterous forms with three facets.

Type (fixed by Van der Goot, 1916), *Aleurodaphis blumeae* V. d. Goot.

Genus CERATAPHIS Lichtenstein.

Plate XVI, F-M.

1862. *Boisduvalia* Signoret, Ann. Ent. Soc. France (4), v. 8, p. 400.
1882. *Cerataphis* Lichtenstein, Bul. Ent. Soc. France (6), v. 2, p. xvi.

Signoret erected his genus Boisduvalia in connection with his aleyrodid monograph. He placed *Coccus lataniae* Bois. as type. Later, however, he considered this a coccid genus. The name was used in the Diptera in 1830, and is therefore not available. The name Cerataphis used by Lichtenstein in 1882 appears as the next name applied to the genus.

Characters.—Cornicles present as mere rings. Apterous form with four-segmented antennæ and aleyrodiform, with two divisions to the body; wax glands prominent; vertex with two hornlike projections; alate form with five-segmented antennæ, the segments armed with narrow annular sensoria. Fore wings with the media once branched, hind wings with both media and cubitus present. Cauda knobbed; anal plate bilobed.

Type (monotypical), *Coccus lataniae* Bois.

Genus THORACAPHIS Van der Goot

Plate XVI, N-W.

1916. *Thoracaphis* Van der Goot, Zur Kenntniss der Blattläuse Java's, p. 242.

Only the apterous form of one species of this genus has been described. Other species, however, are available for study, through the generosity of Professor Van der Goot.

Characters.—Cornicles present and quite distinct, occasionally absent, however, in the apterous form. Apterous form with three-segmented antennæ, flat and with a posterior lobe. Alate form with five-segmented antennæ armed with annular sensoria. Fore wings with the media once branched; hind wings with both media and cubitus present. Cauda somewhat knobbed, anal plate bilobed.

Type (monotypical), *Thoracaphis arboris* V. d. Goot.

GENERA NOT PLACED.

A number of genera have been described which the writer has been unable to place. These genera are discussed in the following notes.

Genus RHIZOBIUS Burmeister.

1835. *Rhizobius* Burmeister, Handbuch der Entomologie, p. 78.
1849. *Rhizophthiridum* Van der Hoeven, Handb. Dierkunde v. 1, p. 508.
1860. *Rhyzoicus* Passerini, Gli Afidi, p. 30.
1863. *Rizobius* Passerini, Aphididae Italicae, p. 79.
1919. *Rhizoicus* Del Guercio, Redia, v. 12, p. 251.

The genus Rhizobius has generally been considered as a good aphid genus and writers have referred to species in this genus as having but one claw to the tarsus. However, as indicated under Paracletus the writer believes this is a variable character and we have no definite knowledge in regard to *pilosellae* Burm. Buckton's species of course was not in the original genus and therefore can not be used as type nor was it in Passerini's conception of Rhyzoicus. After placing Rhyzoicus Pass. with *jujubae* Buckton as type, Del Guercio erects the genus Neorhizobius, distinguished by having two claws, and in which he places *graminis* Thos., *poae* Del Guercio, *stramineus* Del Guercio, and *ulmiphilus* Del Guercio.

In 1860 Passerini set *sonchi* Pass. as the type of Rhizobius Burm., and in a footnote suggested the name Rhyzoicus as a new name for Rhizobius, since this name had previously been used in the Coleoptera. Such procedure, however, is not allowable since *sonchi* Pass. was not in the original genus. Of the two species in the original genus *pilosellae* Burm. has been accepted as type.

Del Guercio in 1917 used the generic name Rhizoicus Pass., spelling it with an "i" instead of a "y", and *jujubae* Buckton as the type.

In the writer's opinion the genus Rhizobius must remain unknown until the type species *pilosellae* becomes known and carefully studied.

The name Rhizophthiridum was given to this genus to replace Rhizobius Burm.

Genus NEORHIZOBIUS Del Guercio.

1917. *Neorhizobius* Del Guercio, Redia, v. 12, p. 251.

As indicated under the discussion of Rhizobius, four species are placed in this genus by Del Guercio. Three species are described as new and only in the apterous forms.

Two of these forms have five-segmented antennæ and one of them four-segmented ones, and when the alate forms are found they will in all probability be shown to represent species either of Forda or Geoica. The basing of genera upon the relative lengths of the antennal segments would create a very large number of genera and separate related forms. The genus Neorhizobius, therefore, the

writer considers composed of apterous forms, which really belong in older and well-recognized genera, but which can not be definitely placed until the alate forms have been secured and studied.

Genus SCHOUTEDENIA Rübsaamen.

1905. *Schoutedenia* Rübsaamen, Marcellia, v. 4, p. 19.

This genus, which was described for *ralumensis* Rüb., is here listed as unknown. The gall formed by the species is described but the writer, never having been able to obtain either gall or insect, would be able only to guess at its position from the description.

Genus CLAVIGERUS Szépligeti.

Clavigerus Szépligeti, Rovarászati Lapok, v. 1, p. 4.

This genus was described in the only volume issued of the Journal cited. The writer has been unable to secure a copy or any details of the description given.

ADDENDA.

The following generic names have been employed by Mordwilko (Fauna Russ. vol. 1, Aphidodea) without, apparently, the mention of any species in connection therewith. They have not been considered in the foregoing paper: Anameson, Aorison, Chaetosiphon, Corylobium, Elatobium, Euaulax, Eurythaphis, Halmodaphis, Impatientinum, Jaxartaphis, Nasonovia, Orobion, Paczoskia, Sitobium, Staticobium, Tlja, Turanaphis, Uroleucon (subgenus), Uromelan. The subgenera Dactynotus Raf., Cladoxus Raf., and Adactynus Raf., have not been considered.

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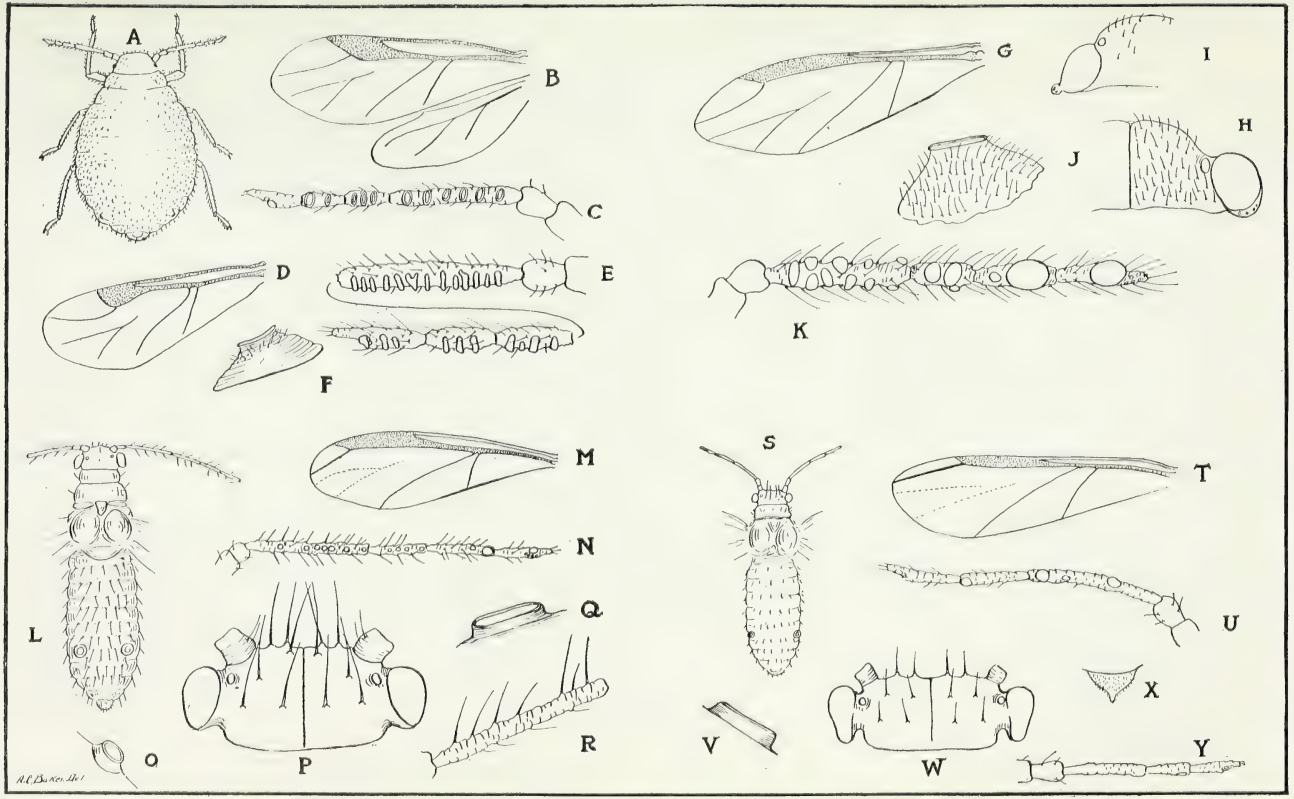
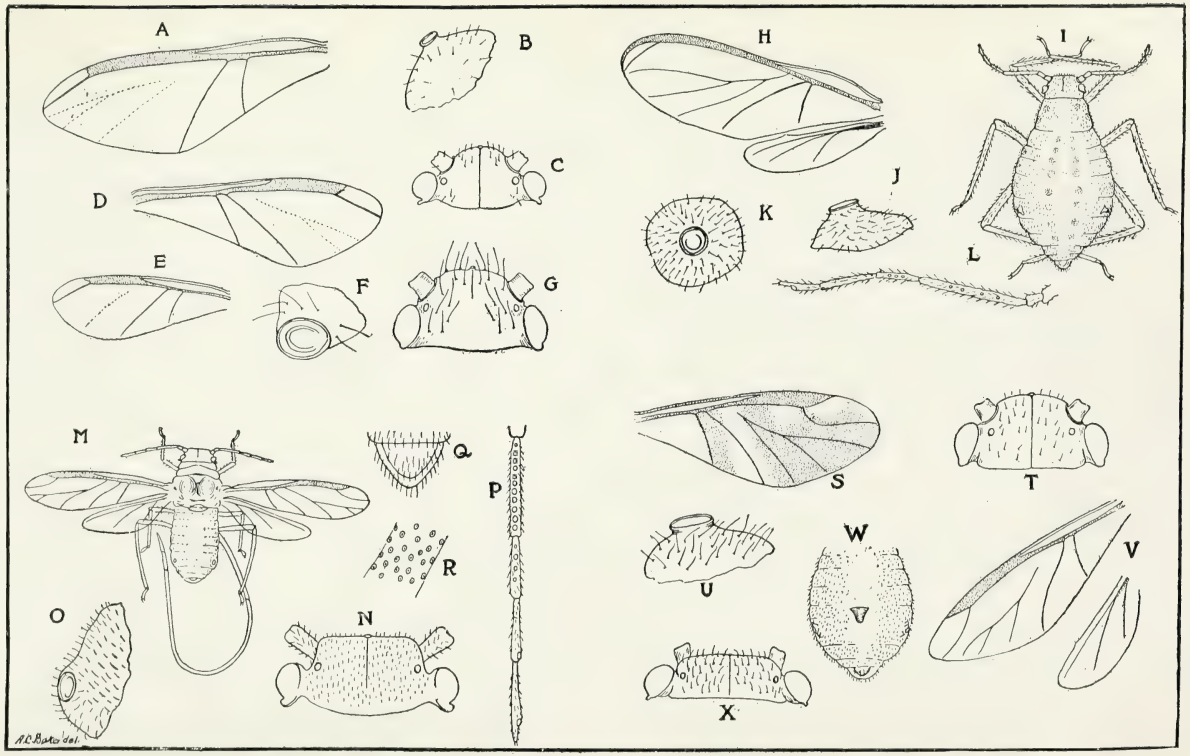
PLATE I.

A.—*Anoecia querci*, apterous form.
B.—*Anoecia querci*, wings.
C.—*Anoecia querci*, antenna of alate form.
D.—*Anoecia corni*, fore wing.
E.—*Anoecia corni*, antenna of alate form.
F.—*Anoecia corni*, cornicle of alate form.
G.—*Nippolachnus pyri*, fore wing.
H.—*Nippolachnus pyri*, head of alate form.
I.—*Anoecia corni*, head of alate form.
J.—*Nippolachnus pyri*, cornicle of alate form.
K.—*Nippolachnus pyri*, antenna of alate form.
L.—*Eulachnus agilis*, body of alate form.
M.—*Eulachnus agilis*, fore wing.
N.—*Eulachnus agilis*, antenna of alate form.
O.—*Eulachnus agilis*, cornicle of alate form.
P.—*Eulachnus rileyi*, head of alate form.
Q.—*Eulachnus rileyi*, cornicle of alate form.
R.—*Eulachnus rileyi*, segment III, antenna of alate form.
S.—*Essigella californica*, body of alate form.
T.—*Essigella californica*, fore wing.
U.—*Essigella californica*, antenna of alate form.
V.—*Essigella californica*, cornicle of alate form.
W.—*Essigella californica*, head of alate form.
X.—*Essigella californica*, cauda of alate form.
Y.—*Essigella californica*, antenna of apterous form



GENERIC CLASSIFICATION OF APHIDIDAE.



GENERIC CLASSIFICATION OF APHIDIDAE.

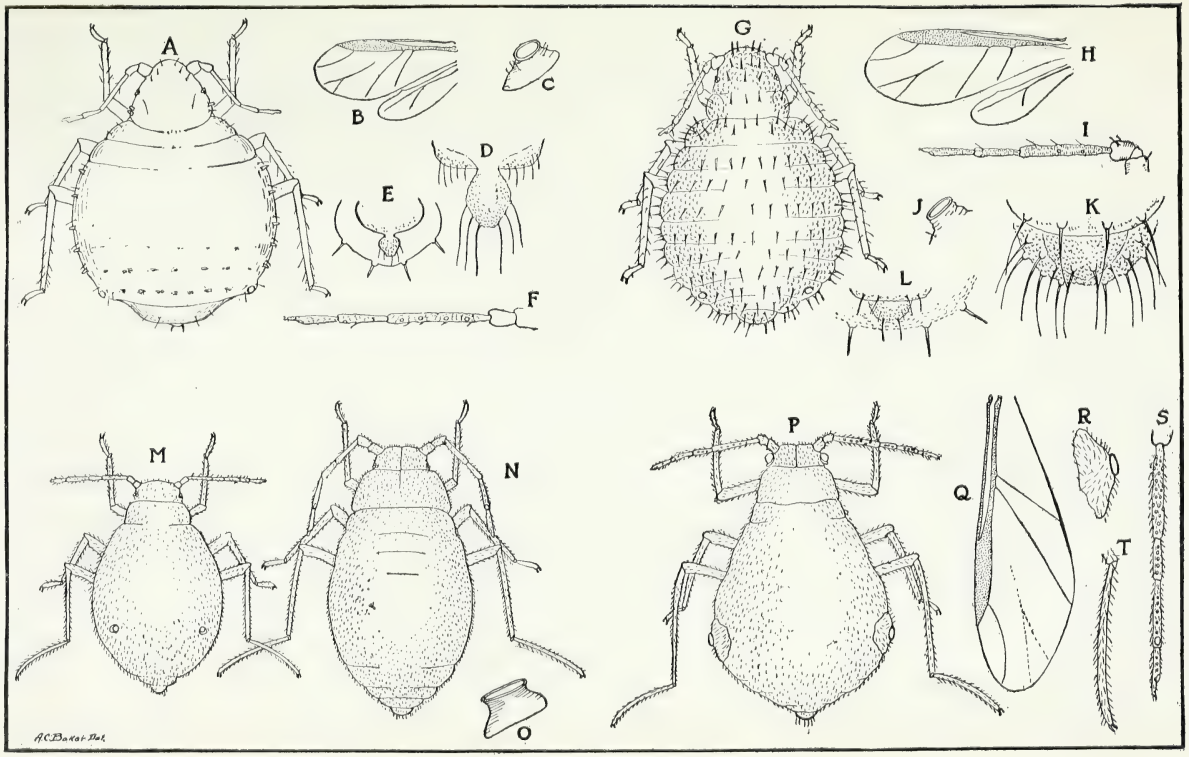
PLATE II.

PLATE II.

A.—*Dilachnus ponderosae*, fore wing.
B.—*Dilachnus ponderosae*, cornicle of apterous form.
C.—*Dilachnus ponderosae*, head of alate form.
D.—*Schizolachnus tomentosus*, fore wing.
E.—*Unilachnus parvus*, fore wing.
F.—*Unilachnus parvus*, cornicle of alate form.
G.—*Unilachnus parvus*, head of alate form.
H.—*Longistigma caryae*, wings.
I.—*Longistigma caryae*, apterous form.
J.—*Longistigma caryae*, cornicle.
K.—*Longistigma caryae*, cornicle.
L.—*Longistigma caryae*, antenna of alate form.
M.—*Stomaphis quercus*, alate form.
N.—*Stomaphis quercus*, head of alate form.
O.—*Stomaphis quercus*, cornicle of alate form.
P.—*Stomaphis quercus*, antenna of alate form.
Q.—*Stomaphis quercus*, cauda and anal plate.
R.—*Stomaphis quercus*, pits on rostrum.
S.—*Pterochlorus roboris*, wing.
T.—*Pterochlorus roboris*, head of alate form.
U.—*Pterochlorus roboris*, cornicle of alate form.
V.—*Pterochlorus viminalis*, wings.
W.—*Pterochlorus viminalis*, abdomen of alate form.
X.—*Pterochlorus viminalis*, head of alate form.

PLATE III.

A.—*Thelaxes dryophila*, apterous form.
B.—*Thelaxes dryophila*, wings.
C.—*Thelaxes dryophila*, cornicle of alate form.
D.—*Thelaxes dryophila*, cauda of alate form.
E.—*Thelaxes dryophila*, cauda of apterous form.
F.—*Thelaxes dryophila*, antenna of alate form.
G.—*Glyphina betulae*, apterous form.
H.—*Glyphina betulae*, wings.
I.—*Glyphina betulae*, antenna of alate form.
J.—*Glyphina betulae*, cornicle of alate form.
K.—*Glyphina betulae*, cauda and anal plate of alate form.
L.—*Glyphina betulae*, cauda and anal plate of apterous form.
M.—*Neotrama delguercioi*, apterous form.
N.—*Trama troglodytes*, apterous form.
O.—*Neotrama delguercioi*, cornicle.
P.—*Protrama radicis*, apterous form.
Q.—*Protrama radicis*, fore wing.
R.—*Protrama radicis*, cornicle of alate form.
S.—*Protrama radicis*, antenna of alate form.
T.—*Protrama radicis*, tarsus of alate form.



GENERIC CLASSIFICATION OF APHIDIDAE.

PLATE III.

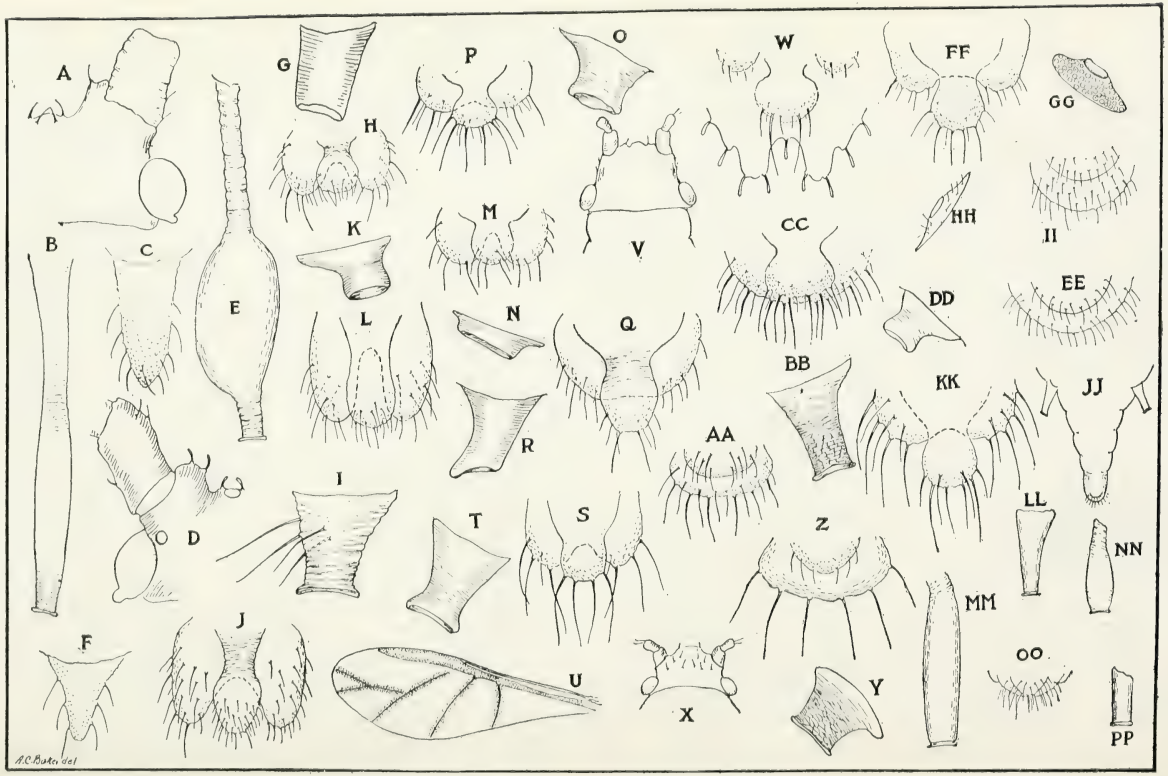


PLATE IV.

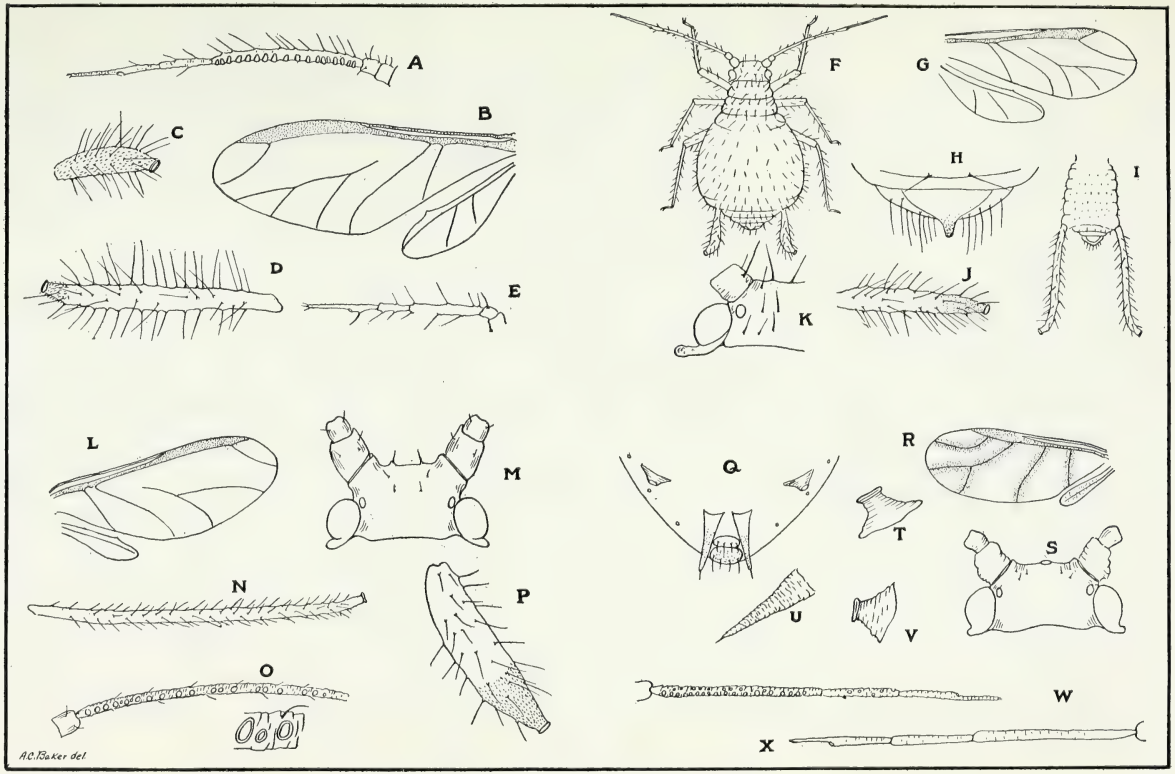
GENERIC CLASSIFICATION OF APHIDIDAE.

PLATE IV.

A.—*Amphorophora rubi*, head of apterous form.
B.—*Amphorophora rubi*, cornicle.
C.—*Amphorophora rubi*, cauda.
D.—*Rhopalosiphoninus latysiphon*, head of alate form.
E.—*Rhopalosiphoninus latysiphon*, cornicle of alate form.
F.—*Rhopalosiphoninus latysiphon*, cauda of alate form.
G.—*Myzocallis coryli*, cornicle.
H.—*Myzocallis coryli*, cauda and anal plate.
I.—*Callipterus juglandis*, cornicle.
J.—*Callipterus juglandis*, cauda and anal plate.
K.—*Therioaphis tiliae*, cornicle.
L.—*Therioaphis tiliae*, cauda and anal plate.
M.—*Monellia caryella*, cauda and anal plate.
N.—*Monellia caryella*, cornicle.
O.—*Chromaphis juglandicola*, cornicle.
P.—*Chromaphis juglandicola*, cauda and anal plate.
Q.—*Euceraphis betulae*, cauda and anal plate.
R.—*Euceraphis betulae*, cornicle.
S.—*Calaphis betulella*, cauda and anal plate.
T.—*Calaphis betulella*, cornicle.
U.—*Calaphis betulella*, fore wing.
V.—*Saltusaphis scirpus*, head of apterous form.
W.—*Saltusaphis scirpus*, cauda and anal plate.
X.—*Thripsaphis balli*, head of apterous form.
Y.—*Neothomasia populicola*, cornicle.
Z.—*Neothomasia populicola*, cauda and anal plate.
AA.—*Periphyllus negundinis*, cauda and anal plate.
BB.—*Periphyllus negundinis*, cornicle.
CC.—*Chaitophorus populi*, cauda and anal plate.
DD.—*Symydobius oblongus*, cornicle.
EE.—*Symydobius oblongus*, cauda and anal plat
FF.—*Phyllaphis fagi*, cauda and anal plate.
GG.—*Phyllaphis fagi*, cornicle.
HH.—*Tamalea coweni*, cornicle.
II.—*Tamalea coweni*, cauda and anal plate.
JJ.—*Drepanaphis acerifolii*, oviparous abdomen.
KK.—*Drepanaphis acerifolii*, cauda and anal plate of alate form.
LL.—*Drepanaphis acerifolii*, cornicle.
MM.—*Drepanosiphum platanoides*, cornicle.
NN.—*Melanoxantherium populifoliae*, cornicle.
OO.—*Melanoxantherium populifoliae*, cauda and anal plate.
PP.—*Pterocomma populeus*, cornicle.

PLATE V.

A.—*Eutrichosiphum pasaniae*, antenna of alate form.
B.—*Eutrichosiphum pasaniae*, wings.
C.—*Eutrichosiphum pasaniae*, cornicle of apterous form.
D.—*Eutrochosiphum pasaniae*, cornicle of alate form.
E.—*Eutrichosiphum pasaniae*, antenna of apterous form.
F.—*Greenidea anonae*, apterous form.
G.—*Greenidea artocarpi*, wings.
H.—*Greenidea artocarpi*, cauda of apterous form.
I.—*Greenidea artocarpi*, cornicle of apterous form.
J.—*Greenidea anonae*, abdomen of alate form.
K.—*Greenidea anonae*, head of alate form.
L.—*Greenideoida elongata*, wings.
M.—*Greenideoida* sp., head of alate form.
N.—*Greenideoida* sp., cornicle of alate form.
O.—*Greenideoida* sp., third antennal segment of alate form.
P.—*Greenideoida hannae*, cornicle of apterous form.
Q.—*Setaphis luteus*, caudal portion of apterous form.
R.—*Setaphis luteus*, wings.
S.—*Setaphis luteus*, head of alate form.
T.—*Setaphis luteus*, cornicle of alate form.
U.—*Setaphis luteus*, spine of alate form.
V.—*Setaphis luteus*, cornicle of apterous form.
W.—*Setaphis luteus*, antenna of alate form.
X.—*Setaphis luteus*, antenna of apterous form.



GENERIC CLASSIFICATION OF APHIDIDAE.

PLATE V.

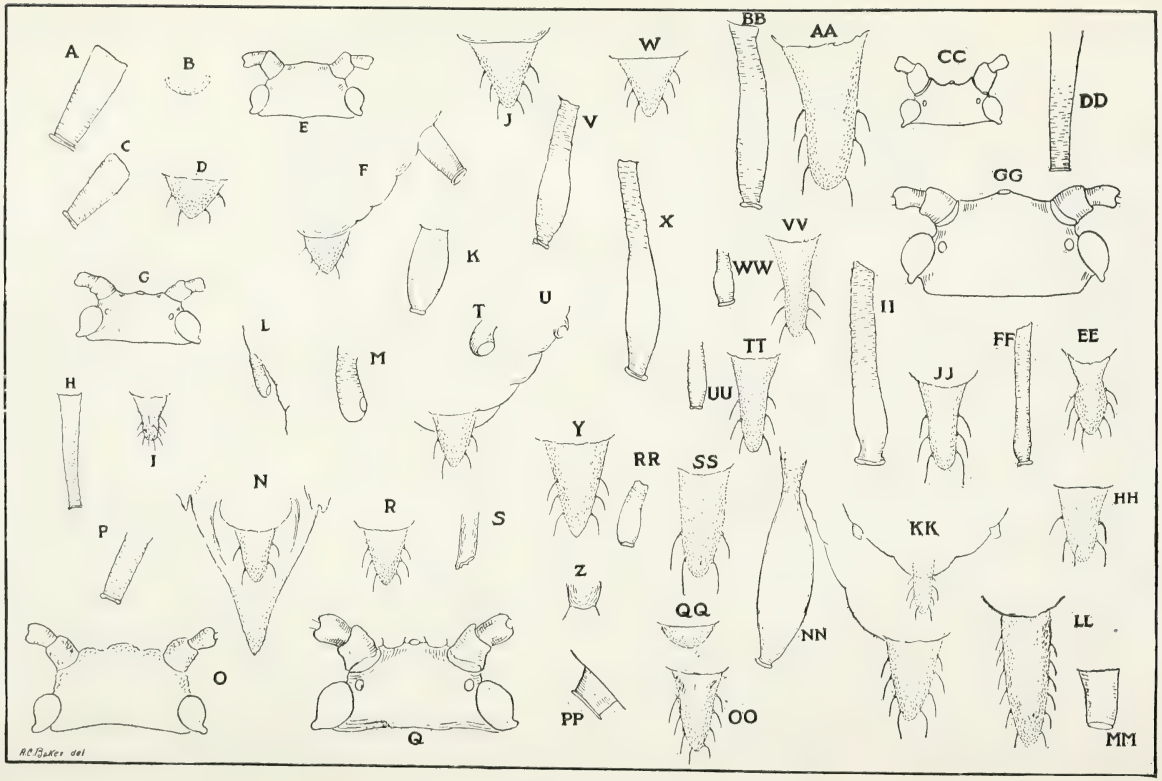


PLATE VI.

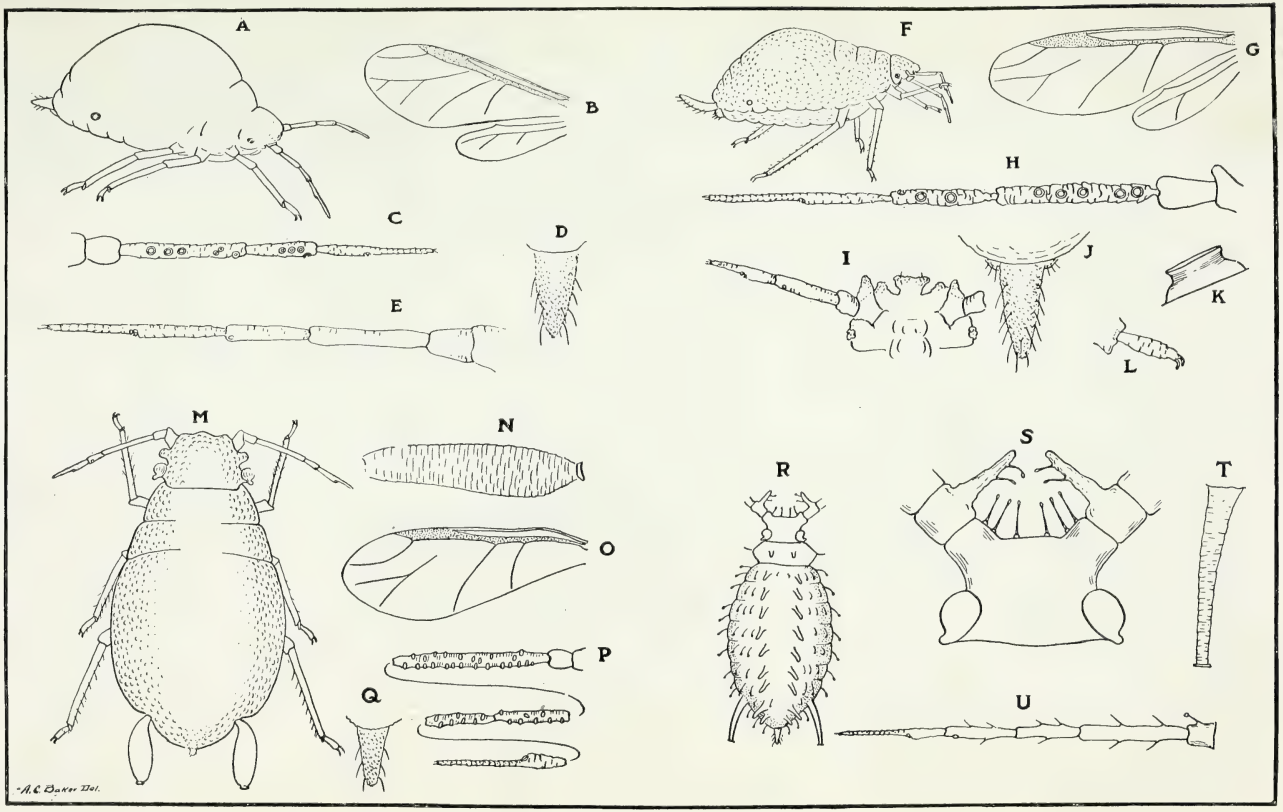
GENERIC CLASSIFICATION OF APHIDIDAE.

PLATE VI.

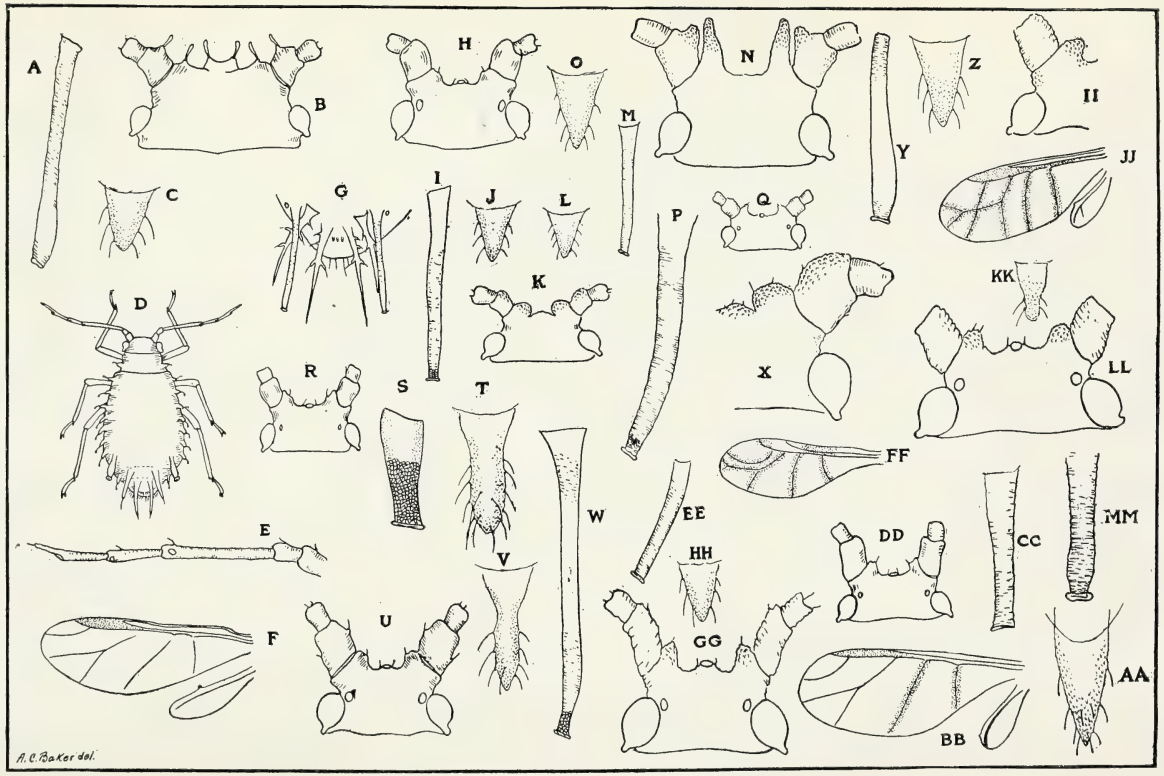
A.—*Acaudus lychnidis*, cornicle of alate form.
B.—*Acaudus lychnidis*, cauda of alate form.
C.—*Anuraphis amygdali*, cornicle of alate form.
D.—*Anuraphis amygdali*, cauda of alate form.
E.—*Anuraphis amygdali*, head of alate form.
F.—*Anuraphis carotae*, cornicle and cauda of alate form.
G.—*Aphis sambuci*, head of alate form.
H.—*Aphis sambuci*, cornicle of alate form.
I.—*Aphis sambuci*, cauda of alate form.
J.—*Brevicoryne brassicae*, cauda of alate form.
K.—*Brevicoryne brassicae*, cornicle of alate form.
L.—*Aspidaphis polygonii*, cornicle of alate form.
M.—*Aspidaphis polygonii*, cornicle more enlarged.
N.—*Aspidaphis polygonii*, cauda of apterous form.
O.—*Aspidaphis polygonii*, head of apterous form.
P.—*Atarsos grindeliae*, cornicle of alate form.
Q.—*Atarsos grindeliae*, head of alate form.
R.—*Atarsos grindeliae*, cauda of alate form.
S.—*Atarsos grindeliae*, tibia of alate form.
T.—*Brachycolus stellariae*, cornicle of alate form.
U.—*Brachycolus stellariae*, cauda of alate form.
V.—*Carolinaia cyperi*, cornicle of alate form.
W.—*Carolinaia cyperi*, cauda of alate form.
X.—*Cavariella pastinacae*, cornicle of alate form.
Y.—*Cavariella pastinacae*, cauda of alate form.
Z.—*Cavariella pastinacae*, tubercle of alate form.
AA.—*Hyadaphis xylostei*, cauda of apterous form.
BB.—*Hyadaphis xylostei*, cornicle of apterous form.
CC.—*Toxoptera aurantiae*, head of alate form.
DD.—*Toxoptera aurantiae*, cornicle of alate form.
EE.—*Toxoptera aurantiae*, cauda of alate form.
FF.—*Rhopalosiphum rufomaculata*, cornicle of alate form.
GG.—*Rhopalosiphum rufomaculata*, head of alate form.
HH.—*Rhopalosiphum rufomaculata*, cauda of alate form.
II.—*Rhopalosiphum nymphaeae*, cornicle of alate form.
JJ.—*Rhopalosiphum nymphaeae*, cauda of alate form.
KK.—*Pergandeidia ononidis*, cauda and cornicle of alate form.
LL.—*Pergandeidia trirhodus*, cauda of apterous form.
MM.—*Pergandeidia trirhodus*, cornicle of apterous form.
NN.—*Liosomaphis berberidis*, cornicle and cauda of apterous form.
OO.—*Liosomaphis berberidis*, cauda of alate form.
PP.—*Cryptosiphum artemesiae*, cornicle of apterous form.
QQ.—*Cryptosiphum artemesiae*, cauda of apterous form.
RR.—*Hyalopterus arundinis*, cornicle of alate form.
SS.—*Hyalopterus arundinis*, cauda of alate form.
TT.—*Hyalopterus deformans*, cauda of apterous form.
UU.—*Hyalopterus deformans*, cornicle of apterous form.
VV.—*Hyalopterus deformans*, cauda of alate form.
WW.—*Hyalopterus deformans*, cornicle of alate form.

PLATE VII.

A.—*Siphonatrophia cupressi*, apterous form.
B.—*Siphonatrophia cupressi*, wings.
C.—*Siphonatrophia cupressi*, antenna of alate form.
D.—*Siphonatrophia cupressi*, cauda of alate form.
E.—*Siphonatrophia cupressi*, antenna of apterous form.
F.—*Sanbornia juniperi*, apterous form.
G.—*Sanbornia juniperi*, wings.
H.—*Sanbornia juniperi*, antenna of alate form.
I.—*Sanbornia juniperi*, head of apterous form from beneath.
J.—*Sanbornia juniperi*, cauda of alate form.
K.—*Sanbornia juniperi*, cornicle.
L.—*Sanbornia juniperi*, tarsus.
M.—*Vesiculaphis caricis*, apterous form.
N.—*Vesiculaphis caricis*, cornicle of alate form.
O.—*Vesiculaphis caricis*, fore wing.
P.—*Vesiculaphis caricis*, antenna of alate form.
Q.—*Vesiculaphis caricis*, cauda of alate form.
R.—*Acanthaphis rubi*, apterous form.
S.—*Acanthaphis rubi*, head of apterous form.
T.—*Acanthaphis rubi*, cornicle of apterous form.
U.—*Acanthaphis rubi*, antenna of apterous form.



GENERIC CLASSIFICATION OF APHIDIDAE.



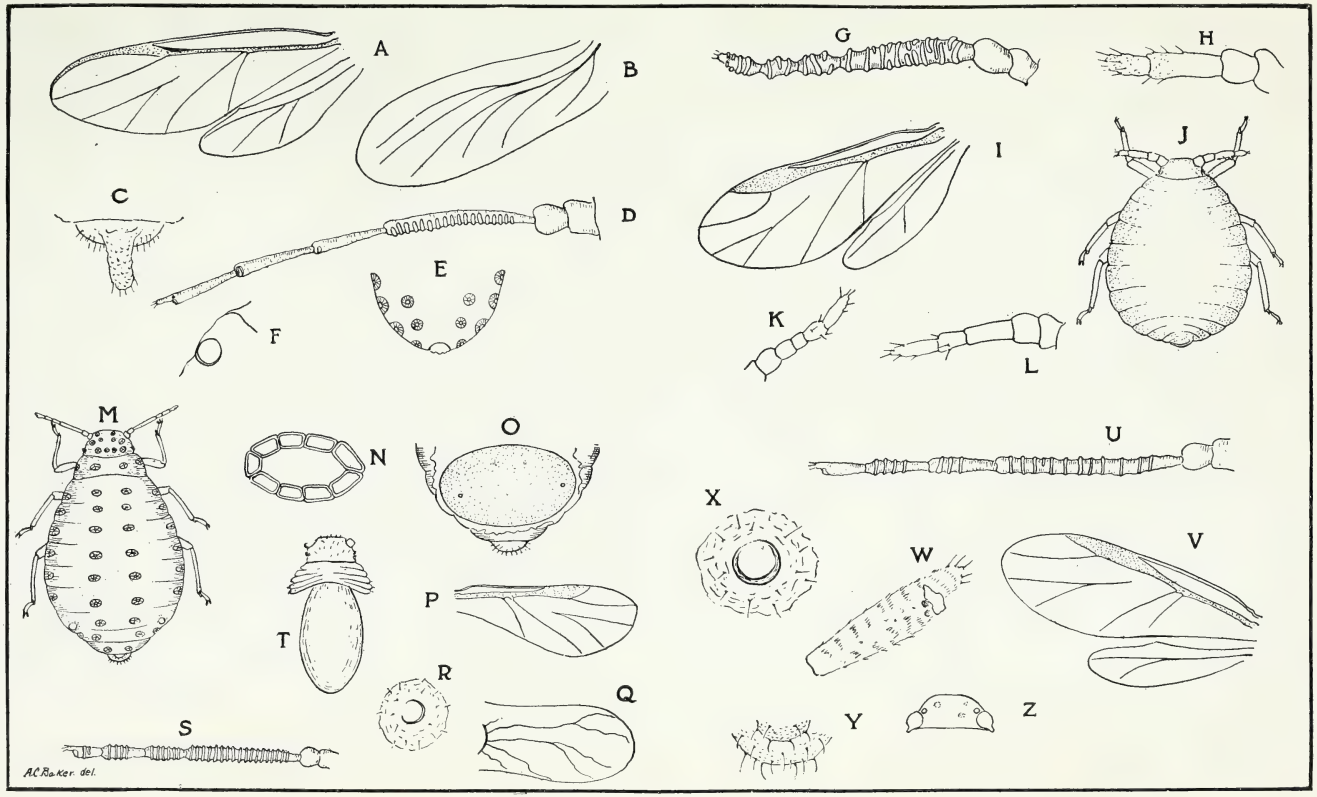
GENERIC CLASSIFICATION OF APHIDIDAE.

PLATE VIII.

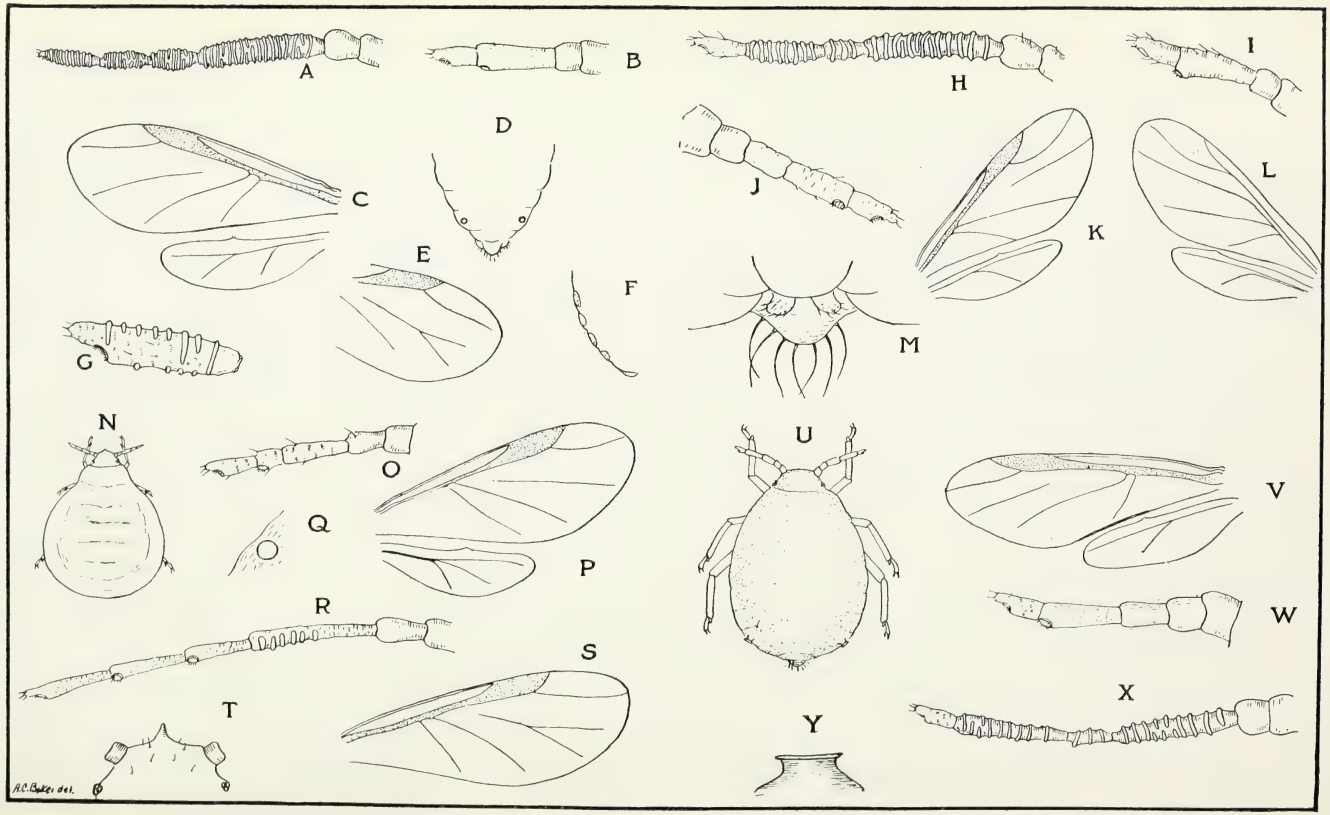
A.—*Capitophorus shepardiae*, cornicle of alate form.
B.—*Capitophorus shepardiae*, head of alate form.
C.—*Capitophorus shepardiae*, cauda of alate form.
D.—*Anomalaphis comperi*, apterous form.
E.—*Anomalaphis comperi*, antenna of apterous form.
F.—*Anomalaphis comperi*, wings.
G.—*Cervaphis schoutedeniae*, extremity of abdomen.
H.—*Illinoia liriodendri*, head of alate form.
I.—*Illinoia liriodendri*, cornicle of alate form.
J.—*Illinoia liriodendri*, cauda of alate form.
K.—*Myzus cerasi*, head of apterous form.
L.—*Myzus cerasi*, cauda of apterous form.
M.—*Myzus cerasi*, cornicle of alate form.
N.—*Phorodon humuli*, head of apterous form.
O.—*Phorodon humuli*, cauda of apterous form.
P.—*Phorodon humuli*, cornicle of apterous form.
Q.—*Phorodon humuli*, head of alate form.
R.—*Macrosiphonella sanborni*, head of alate form.
S.—*Macrosiphonella sanborni*, cornicle of alate form.
T.—*Macrosiphonella sanborni*, cauda of alate form.
U.—*Macrosiphum rosae*, head of alate form.
V.—*Macrosiphum rosae*, cauda of alate form.
W.—*Macrosiphum rosae*, cornicle of alate form.
X.—*Myzus persicae*, head of apterous form.
Y.—*Myzus persicae*, cornicle of alate form.
Z.—*Myzus persicae*, cauda of alate form.
AA.—*Microparsus variabilis*, cauda of alate form.
BB.—*Microparsus variabilis*, wings.
CC.—*Microparsus variabilis*, cornicle of alate form.
DD.—*Microparsus variabilis*, head of alate form.
EE.—*Idiopterus nephrolepidis*, cornicle of alate form.
FF.—*Idiopterus nephrolepidis*, fore wing.
GG.—*Idiopterus nephrolepidis*, head of alate form.
HH.—*Idiopterus nephrolepidis*, cauda of alate form.
II.—*Pentalonia nigronervosa*, head of apterous form.
JJ.—*Pentalonia nigronervosa*, wings.
KK.—*Pentalonia nigronervosa*, cauda of alate form.
LL.—*Pentalonia nigronervosa*, head of alate form.
MM.—*Pentalonia nigronervosa*, cornicle of alate form.

Plate IX.

A.—*Mindarus abietinus*, wings.
B.—*Mindarus abietinus*, fore wing showing tracheæ.
C.—*Mindarus abietinus*, cauda of alate form.
D.—*Mindarus abietinus*, antenna of alate form.
E.—*Mindarus abietinus*, abdomen of pupa.
F.—*Mindarus abietinus*, cornicle of alate form.
G.—*Colopha ulmicola*, antenna of alate form.
H.—*Colopha ulmicola*, antenna of stem mother.
I.—*Colopha ulmicola*, wings.
J.—*Colopha ulmicola*, apterous form.
K.—*Colopha ulmicola*, antenna of apterous form.
L.—*Colopha ulmicola*, antenna of apterous form.
M.—*Eriosoma lanigerum*, apterous form.
N.—*Eriosoma lanigerum*, wax plate.
O.—*Eriosoma lanigerum*, wax reservoir.
P.—*Eriosoma lanigerum*, fore wing.
Q.—*Eriosoma lanigerum*, wing pad showing tracheæ.
R.—*Eriosoma lanigerum*, cornicle.
S.—*Eriosoma lanigerum*, antenna of alate form.
T.—*Eriosoma lanigerum*, oviparous female, showing egg.
U.—*Georgia ulmi*, antenna of alate form.
V.—*Georgia ulmi*, wings.
W.—*Georgia ulmi*, distal segment of antenna of alate form.
X.—*Georgia ulmi*, cornicle of alate form.
Y.—*Georgia ulmi*, cauda and anal plate of alate form.
Z.—*Georgia ulmi*, head of alate form.



GENERIC CLASSIFICATION OF APHIDIDAE.



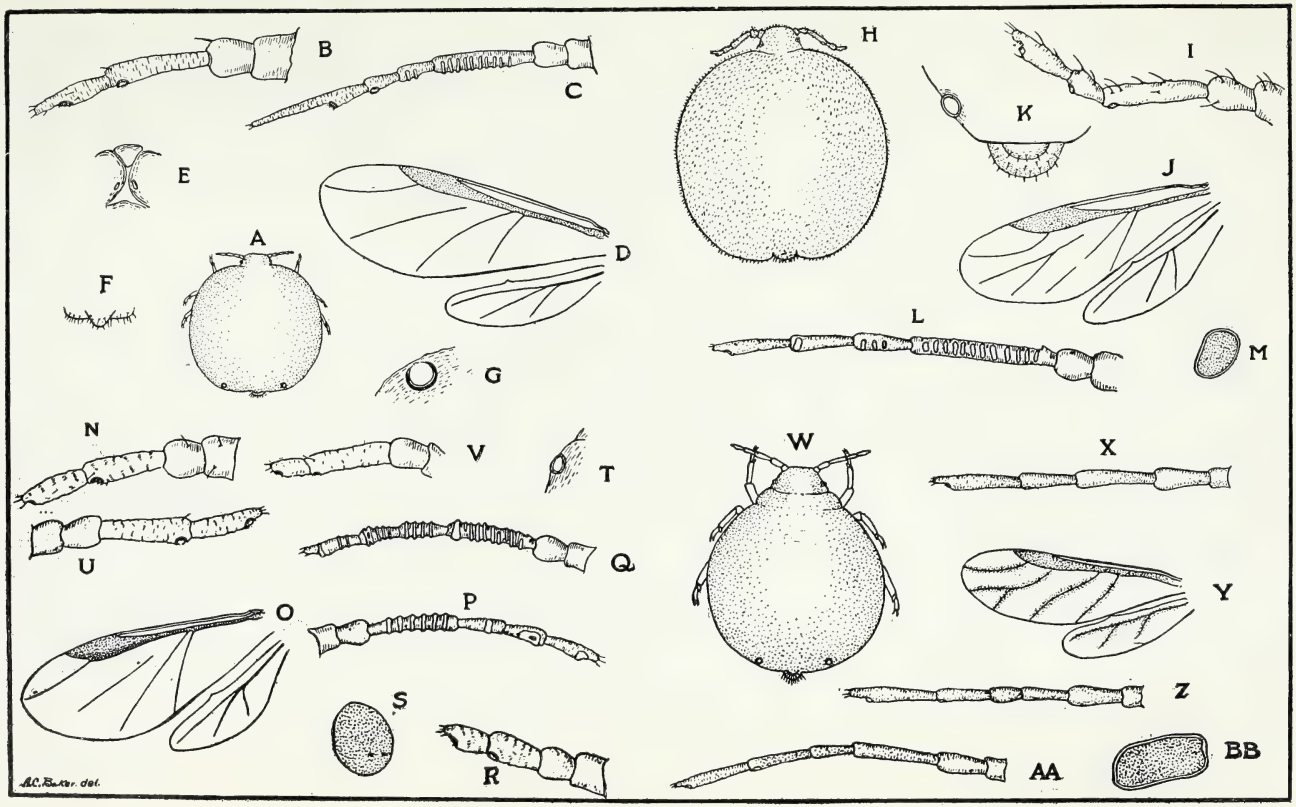
GENERIC CLASSIFICATION OF APHIDIDAE.

PLATE X.

A.—*Gobaishia pallida*, antenna of alate form.
B.—*Gobaishia pallida*, antenna of stem mother.
C.—*Gobaishia pallida*, wings.
B.—*Gobaishia pallida*, abdomen of alate form showing cornicle.
E.—*Gobaishia pallida*, fore wing.
F.—*Gobaishia pallida*, abdomen of pupa.
G.—*Gobaishia pallida*, distal segment of antenna of alate form from above.
H.—*Tetraneura ulmifoliae*, antenna of alate form.
I.—*Tetraneura ulmifoliae*, antenna of stem mother.
J.—*Tetraneura ulmifoliae*, antenna of apterous form.
K.—*Tetraneura ulmifoliae*, wings.
L.—*Tetraneura ulmifoliae*, wings showing tracheæ.
M.—*Tetraneura ulmifoliae*, cauda and anal plate.
N.—*Cornaphis populi*, stem mother.
O.—*Cornaphis populi*, antenna of stem mother.
P.—*Cornaphis populi*, wings.
Q.—*Cornaphis populi*, cornicle of alate form.
R.—*Cornaphis populi*, antenna of alate form.
S.—*Cornaphis populi*, fore wing.
T.—*Cornaphis populi*, head showing horn.
U.—*Dryopeia bella*, apterous form.
V.—*Dryopeia bella*, wings.
W.—*Dryopeia bella*, antenna of apterous form.
X.—*Dryopeia bella*, antenna of alate form.
Y.—*Dryopeia bella*, cornicle of apterous form.

PLATE XI.

A.—*Mordwilkoja vagabunda*, stem mother.
B.—*Mordwilkoja vagabunda*, antenna of stem mother.
C.—*Mordwilkoja vagabunda*, antenna of alate form.
D.—*Mordwilkoja vagabunda*, wings.
E.—*Mordwilkoja vagabunda*, thorax of alate form.
F.—*Mordwilkoja vagabunda*, cauda of alate form.
G.—*Mordwilkoja vagabunda*, cornicle of alate form.
H.—*Asiphum* sp. stem mother.
I.—*Asiphum* sp. antenna of stem mother.
J.—*Pachypappella vesicalis*, wings.
K.—*Pachypappella vesicalis*, cornicles and cauda of alate form.
L.—*Pachypappella vesicalis*, antenna of alate form.
M.—*Pachypappella vesicalis*, wax plate.
N.—*Pemphigus bursarius*, antenna of stem mother.
O.—*Pemphigus bursarius*, wings.
P.—*Pemphigus bursarius*, antenna of alate form.
Q.—*Pemphigus bursarius*, antenna of alate form.
R.—*Pemphigus bursarius*, antenna of stem mother.
S.—*Pemphigus bursarius*, wax plate.
T.—*Pemphigus bursarius*, cornicle of alate form.
U.—*Pemphigus populicaulis*, antenna of stem mother.
V.—*Gobaishia ulmifuscus*, antenna of stem mother.
W.—*Phloeomyzus passerini*, apterous form.
X.—*Phloeomyzus passerini*, antenna of apterous form.
Y.—*Phloeomyzus passerini*, wings.
Z.—*Phloeomyzus passerini*, antenna of apterous form.
AA.—*Phloeomyzus passerini*, antenna of alate form.
BB.—*Phloeomyzus passerini*, wax plate.



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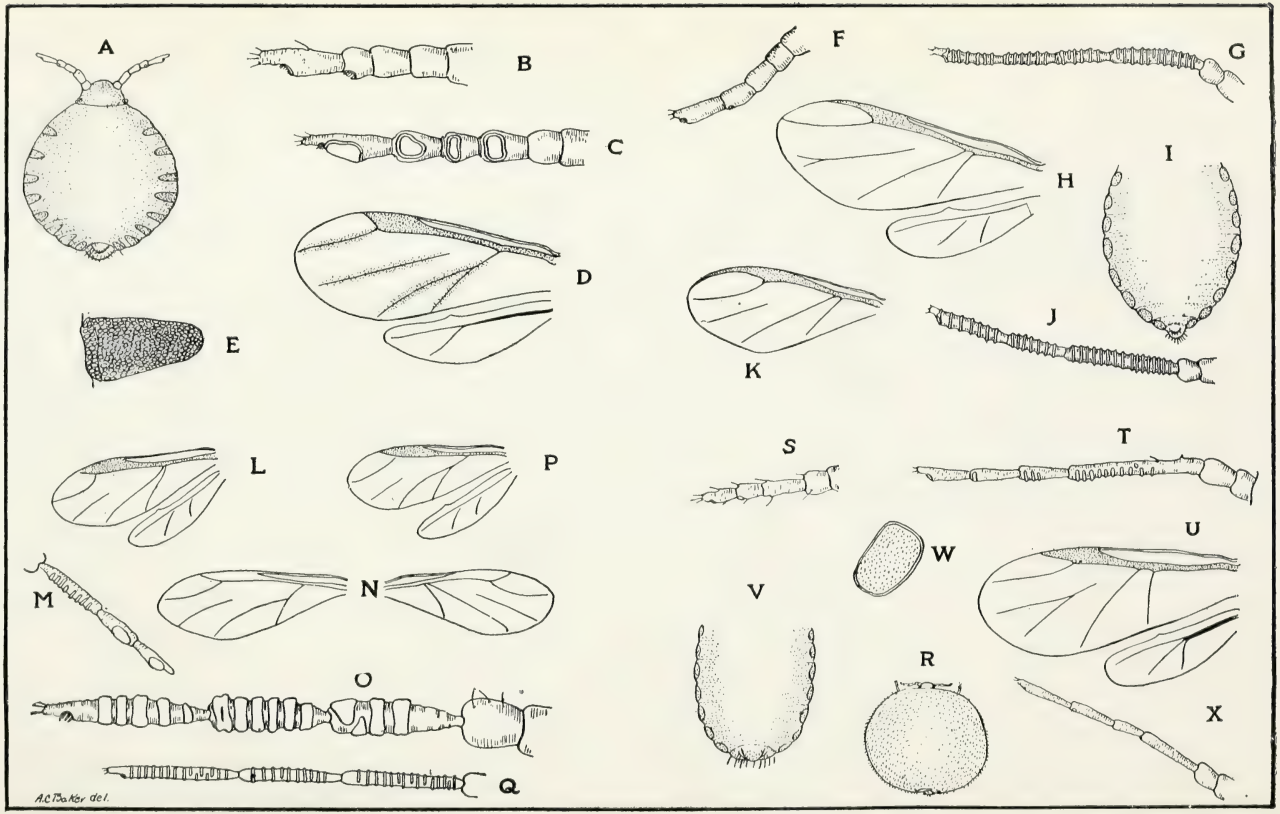


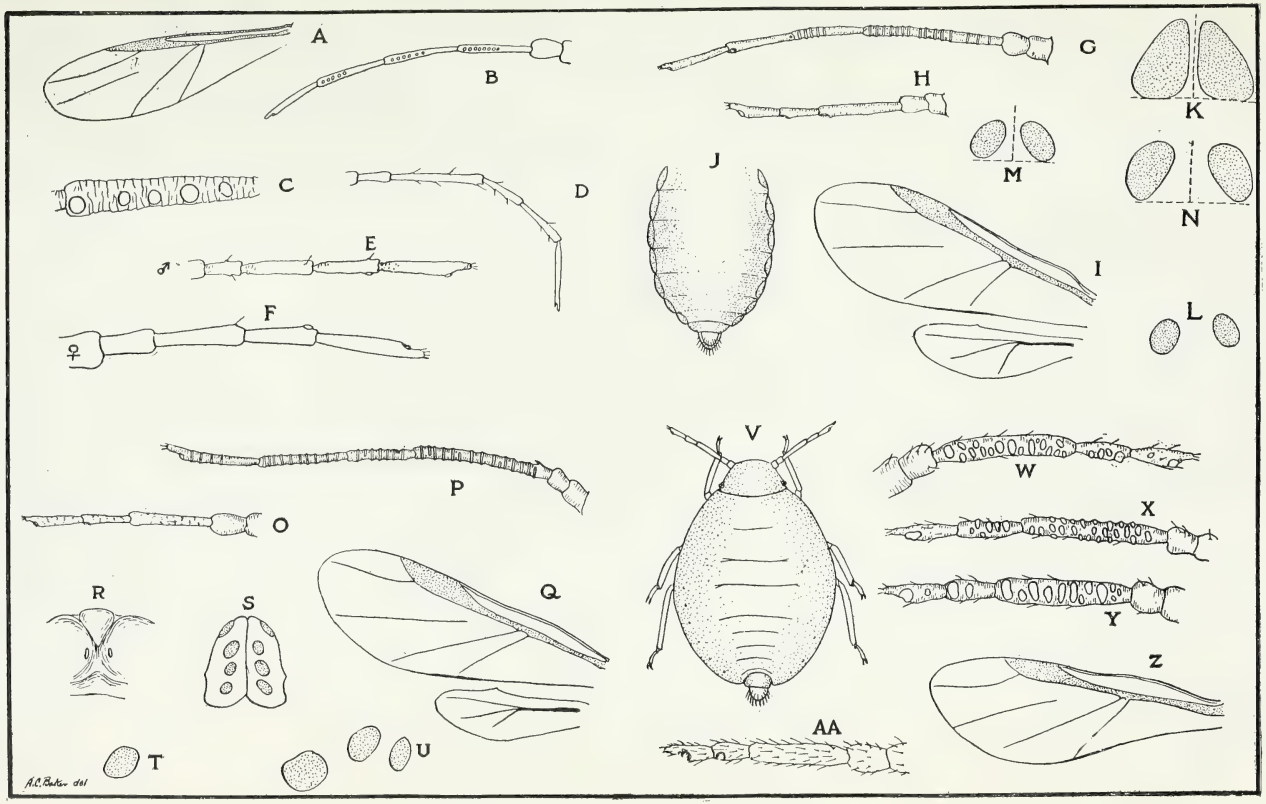
GENERIC CLASSIFICATION OF APHIDIDAE.

PLATE XII.

A.—*Aploneura lentici*, apterous form.
B.—*Aploneura lentici*, antenna of apterous form.
C.—*Aploneura lentici*, antenna of alate form.
D.—*Aploneura lentici*, wings.
E.—*Aploneura lentici*, abdominal wax plate.
F.—*Melaphis rhois*, antenna of apterous form.
G.—*Melaphis rhois*, antenna of alate form.
H.—*Melaphis rhois*, wings.
I.—*Melaphis rhois*, abdomen of alate form.
J.—*Melaphis rhois*, antenna of alate form.
K.—*Melaphis chinensis*, fore wing.
L.—*Nurudea ibofushi*, wings.
M.—*Nurudea ibofushi*, antenna of alate form.
N.—*Nurudea shiraii*, wings.
O.—*Nurudea shiraii*, antenna of alate form.
P.—*Nurudea rosea*, fore wing.
Q.—*Nurudea rosea*, antenna of alate form.
R.—*Asiphum tremulae*, stem mother.
S.—*Asiphum tremulae*, antenna of stem mother.
T.—*Asiphum tremulae*, antenna of alate form.
U.—*Asiphum tremulae*, wings.
V.—*Asiphum tremulae*, abdomen of alate form.
W.—*Asiphum tremulae*, wax plates.
X.—*Asiphum tremulae*, antenna of apterous form.

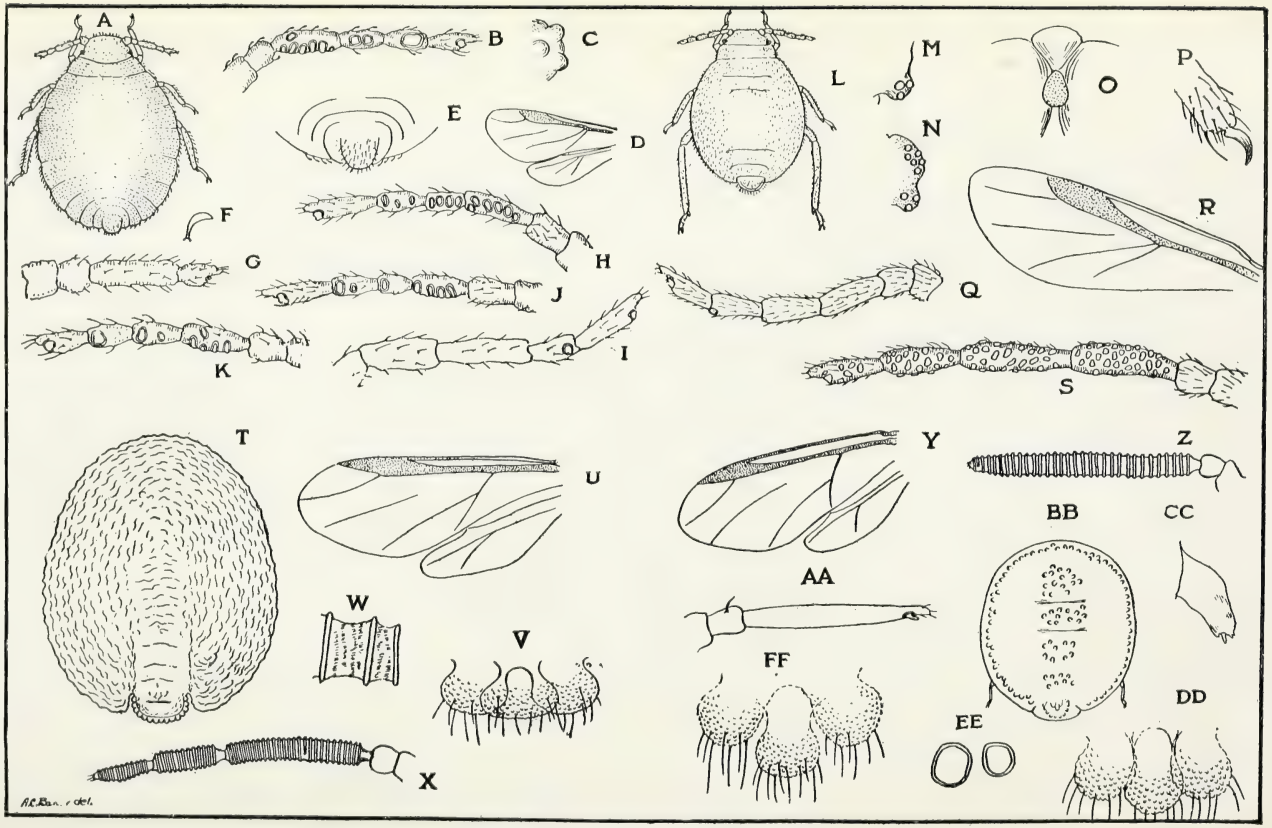
PLATE XIII.

A.—*Neoprociphilus attenuatus*, forewing.
B.—*Neoprociphilus attenuatus*, antenna of alate form.
C.—*Neoprociphilus attenuatus*, segment V of antenna of alate form.
D.—*Neoprociphilus attenuatus*, antenna of apterous form.
E.—*Neoprociphilus attenuatus*, antenna of male.
F.—*Neoprociphilus attenuatus*, antenna of oviparous female.
G.—*Prociphilus bumeliae*, antenna of alate female.
H.—*Prociphilus bumeliae*, antenna of stem mother.
I.—*Prociphilus bumeliae*, wings.
J.—*Prociphilus bumeliae*, abdomen of alate form.
K.—*Prociphilus bumeliae*, thoracic wax plates.
L.—*Prociphilus bumeliae*, head wax plates.
M.—*Prociphilus xylostei*, thoracic wax plates.
N.—*Prociphilus bumeliae (poscheringi)*, thoracic wax plates.
O.—*Thecabius affinis*, antenna of stem mother.
P.—*Thecabius affinis*, antenna of alate form.
Q.—*Thecabius affinis*, wings.
R.—*Thecabius affinis*, thorax of alate form.
S.—*Thecabius affinis*, head wax plates of stem mother.
T.—*Thecabius affinis*, abdominal wax plate.
U.—*Thecabius affinis*, abdominal wax plates of stem mother.
V.—*Forda* sp., apterous form.
W.—*Forda olivacea*, antenna of alate form.
X.—*Forda trivialis*, antenna of alate form.
Y.—*Forda marginata*, antenna of alate form.
Z.—*Forda olivacea*, fore wing.
AA.—*Forda formicaria*, antenna of apterous form.



GENERIC CLASSIFICATION OF APHIDIDAE.

PLATE XIII.



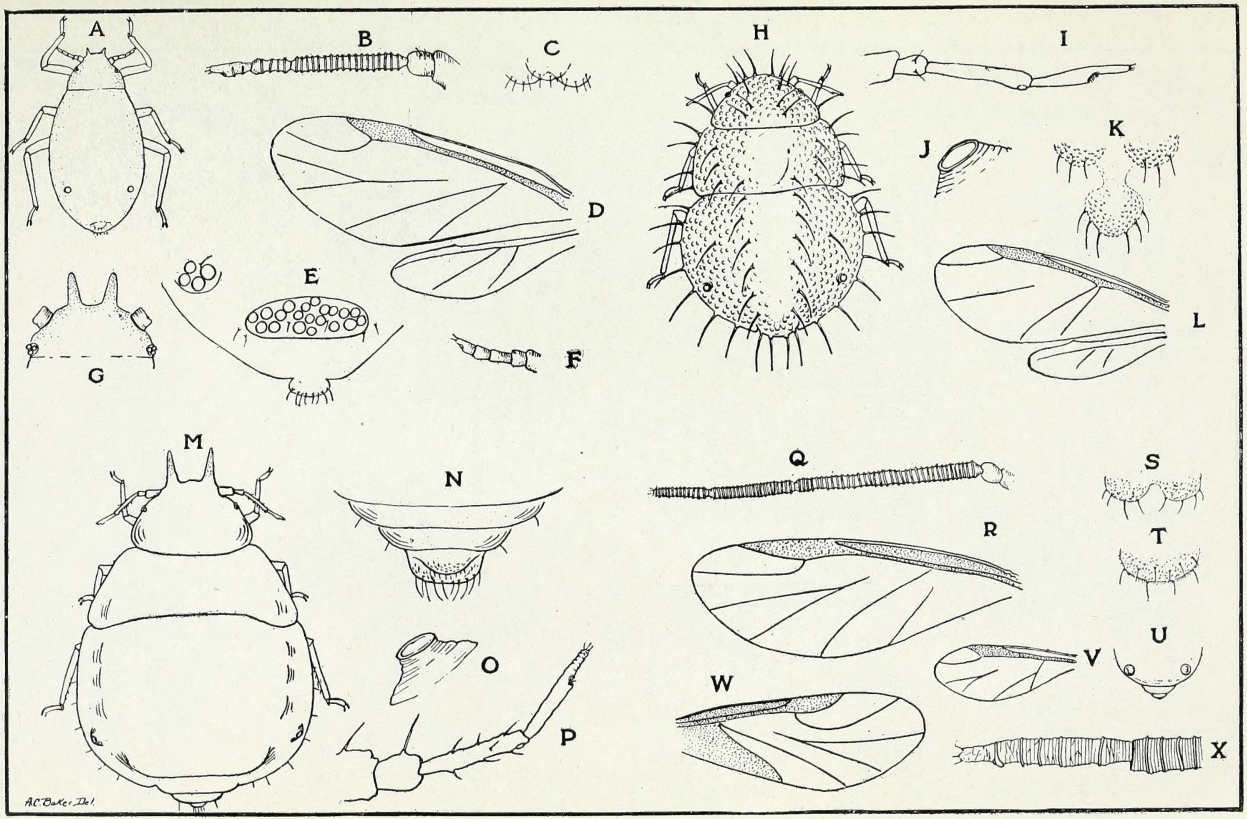
GENERIC CLASSIFICATION OF APHIDIDAE.

PLATE XIV.

A.—*Geoica squamosa*, apterous form.
B.—*Geoica squamosa*, antenna of alate form.
C.—*Geoica squamosa*, eye of apterous form.
D.—*Geoica squamosa*, wings.
E.—*Geoica squamosa*, caudal extremity of apterous form.
F.—*Geoica squamosa*, squama.
G.—*Geoica squamosa*, four-segmented antenna of apterous form.
H.—*Geoica phaseoli*, antenna of alate form.
I.—*Geoica phaseoli*, antenna of apterous form.
J.—*Geoica radicicola*, antenna of alate form.
K.—*Geoica lucifuga*, antenna of alate form.
L.—*Paracletus cimiciformis*, apterous form.
M.—*Paracletus cimiciformis*, eye of apterous form.
N.—*Paracletus cimiciformis*, intermediate eye.
O.—*Paracletus cimiciformis*, median thoracic wax plate of alate form.
P.—*Paracletus cimiciformis*, foot of alate form with one claw.
Q.—*Paracletus cimiciformis*, antenna of apterous form.
R.—*Paracletus cimiciformis*, forewing.
S.—*Paracletus cimiciformis*, antenna of alate form.
T.—*Hamamelistes spinosus*, hibernating apterous form.
U.—*Hamamelistes spinosus*, wings.
V.—*Hamamelistes spinosus*, cauda and anal plate of alate form.
W.—*Hamamelistes spinosus*, antenna of alate form.
X.—*Hamamelistes spinosus*, portion of same, more enlarged.
Y.—*Hormaphis hamamelidis*, wings.
Z.—*Hormaphis hamamelidis*, antenna of alate form.
AA.—*Hormaphis hamamelidis*, antenna of stem mother.
BB.—*Hormaphis hamamelidis*, apterous form.
CC.—*Hormaphis hamamelidis*, antenna of apterous form.
DD.—*Hormaphis hamamelidis*, cauda and anal plate of apterous form.
EE.—*Hormaphis hamamelidis*, dorsal wax pores.
FF.—*Hormaphis hamamelidis*, cauda and anal plate of alate form.

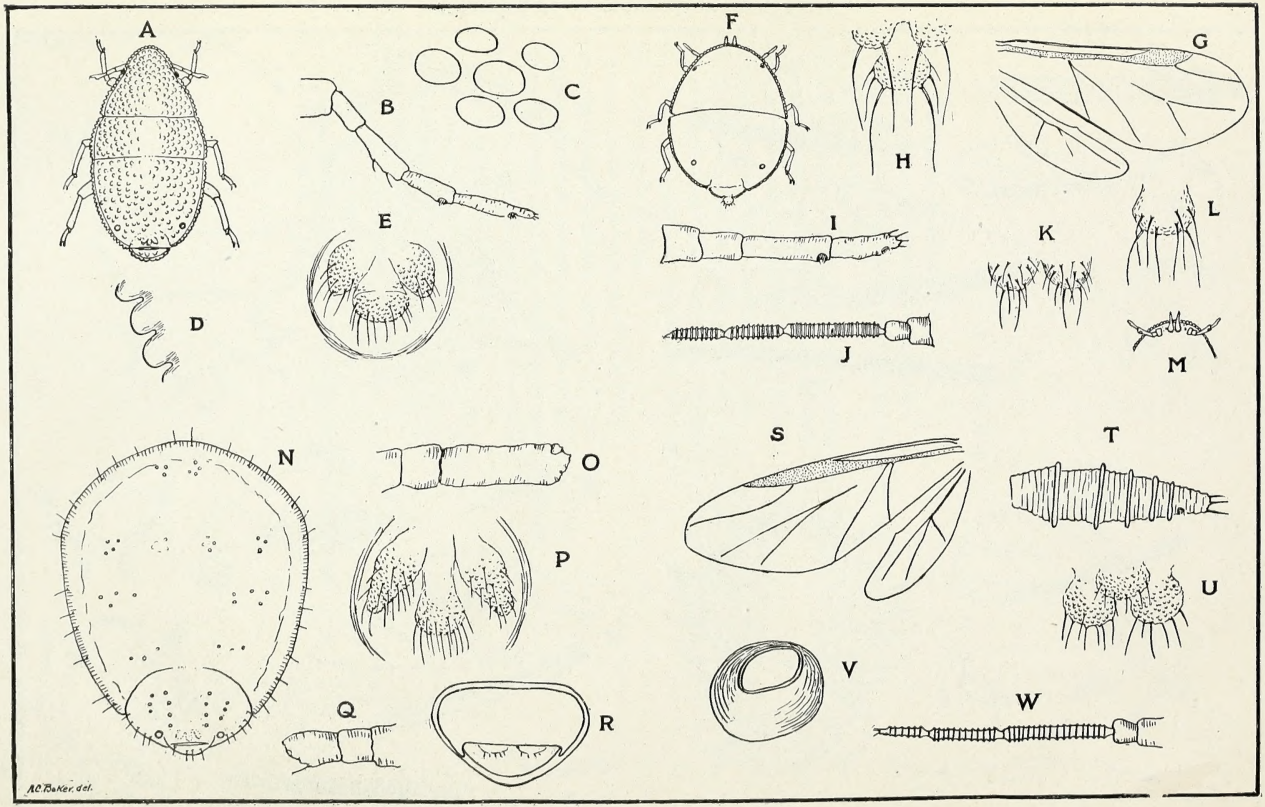
PLATE XV.

A.—*Oregma lanigera*, apterous form.
B.—*Oregma lanigera*, antenna of alate form.
C.—*Oregma lanigera*, cauda and anal plate of alate form.
D.—*Oregma lanigera*, wings.
E.—*Oregma lanigera*, end of abdomen of apterous form.
F.—*Oregma lanigera*, antenna of apterous form.
G.—*Oregma bambusae*, head of apterous form.
H.—*Glyphinaphis bambusae*, apterous form.
I.—*Glyphinaphis bambusae*, antenna of apterous form.
J.—*Glyphinaphis bambusae*, cornicle of apterous form.
K.—*Glyphinaphis bambusae*, cauda and anal plate.
L.—*Mansakia miyabei*, wings.
M.—*Ceratoglyphina bambusae*, apterous form.
N.—*Ceratoglyphina bambusae*, cauda and anal plate.
O.—*Ceratoglyphina bambusae*, cornicle of apterous form.
P.—*Ceratoglyphina bambusae*, antenna of apterous form.
Q.—*Astegopteryx distychii*, antenna of alate form.
R.—*Astegopteryx distychii*, fore wing.
S.—*Astegopteryx distychii*, anal plate of alate form.
T.—*Astegopteryx distychii*, cauda of alate form.
U.—*Astegopteryx distychii*, end of abdomen.
V.—*Astegopteryx styracophila*, fore wing.
W.—*Astegopteryx gallarum*, fore wing.
X.—*Astegopteryx gallarum*, tip of antenna of alate form.



GENERIC CLASSIFICATION OF APHIDIDAE.

PLATE XV.



GENERIC CLASSIFICATION OF APHIDIDAE.

PLATE XVI.

A.—*Aleurodaphis blumeae*, apterous form.
B.—*Aleurodaphis blumeae*, antenna of apterous form.
C.—*Aleurodaphis blumeae*, dorsal wax pores.
D.—*Aleurodaphis blumeae*, margin.
E.—*Aleurodaphis blumeae*, cauda and anal plate.
F.—*Cerataphis lataniae*, apterous form.
G.—*Cerataphis lataniae*, wings.
H.—*Cerataphis lataniae*, cauda and anal plate of apterous form.
I.—*Cerataphis lataniae*, antenna of apterous form.
J.—*Cerataphis lataniae*, antenna of alate form.
K.—*Cerataphis lataniae*, anal plate of alate form.
L.—*Cerataphis lataniae*, cauda of alate form.
M.—*Cerataphis lataniae*, head of apterous form, central view.
N.—*Thoracaphis arboris*, apterous form.
O.—*Thoracaphis arboris*, antenna of apterous form.
P.—*Thoracaphis arboris*, cauda and anal plate of apterous form.
Q.—*Thoracaphis ficus*, antenna of apterous form.
R.—*Thoracaphis ficus*, extremity of abdomen, apterous form.
S.—*Thoracaphis castaneae*, wings.
T.—*Thoracaphis castaneae*, distal segment of antenna of alate form.
U.—*Thoracaphis castaneae*, cauda and anal plate of alate form.
V.—*Thoracaphis castaneae*, cornicle of alate form.
W.—*Thoracaphis castaneae*, antenna of alate form.

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